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Forestry Best Management Practices Monitoring

2004 FORESTRY BMP AUDIT REPORT

Department of Natural Resources & Conservation · Forestry Division ·Missoula, MT 59804-3199

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FORESTRY BEST MANAGEMENT PRACTICES MONITORING

THE 2004 FORESTRY BMP AUDIT REPORT

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
FORESTRY DIVISION
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EXECUTIVE SUMMARY

The Forestry Best Management Practice (BMP) audit process is used to evaluate whether BMPs are being applied and if they are effectively limiting non-point source pollution from logging operations in Montana. The Governor has requested the Montana Department of Natural Resources and Conservation (DNRC), Forestry Division, to evaluate forest practices for BMP implementation and report the findings to the Environmental Quality Council (EQC). This report summarizes the findings of Montana's 2004 forestry BMP audits, and complements similar study reports completed biannually since 1990.

In 2004 three interdisciplinary teams conducted the audits. Each team was composed of a fisheries biologist, a forester, a hydrologist, a representative of a conservation group, a road engineer, a soil scientist, and a non-industrial private forest (NIPF) landowner or logging professional. DNRC used established site selection criteria to select thirty-nine (39) new timber harvest sites harvested since 2001. The selection criteria limited the sample to those sites most sensitive to the practices that affect water quality. The audit teams evaluated a maximum of forty-nine (49) BMPs at each site, rating application and effectiveness for each BMP on a five-point scale.

The audit teams evaluated thirty-nine (39) sites for **BMP application.** Audit results showed that across all ownerships, BMPs were properly applied 97 percent of the time. Although many harvest sites had at least one instance where a BMP was inadequately applied, a majority of the departures were minor and did not cause erosion or deliver material to a stream. Thirteen percent of the sites had one or more major BMP departures in application. This is a 10 percent decrease from the 2002 audit results. The application of eight high risk BMPs was evaluated separately because these are among those most important for protecting soil and water resources. Eighty-nine percent of these high risk BMPs were properly applied, a 1 percent decrease from the 2002 results.

The audit teams also evaluated the same sites for **BMP effectiveness**. Audit results showed that across all ownerships, BMPs were effective in protecting soil and water resources 98 percent of the time. Thirteen percent of the sites had some minor departures in BMP effectiveness. Minor departures in effectiveness produce minor impacts to soil and water resources; eroded material reaches draws, but not streams. Fifteen percent of the sites had one or more major departures in BMP effectiveness. This is a 20 percent decrease from the 2002 audits results. Ninety-five percent of the eight high risk BMPs evaluated were rated as providing adequate protection to soil and water resources.

The greatest frequency of departures from BMPs, and the most impacts, were associated with road maintenance and road surface drainage. The text includes a list of problematic BMPs on page 23.

The audit teams also evaluated application and implementation of the Montana Streamside Management (SMZ) Law. There were eight SMZ rules departures noted. All but two of these were minor and produced no discernible impacts to soil and water resources.

Summary of BMP and SMZ Application and Effectiveness, by Ownership Group

Practice	DNRC	Federal	Industry	NIPF	Totals
BMP Application	97%	93%	99%	94%	97%
BMP Effectiveness	98%	96%	99%	99%	99%
SMZ Application	100%	99%	98%	92%	98%
SMZ Effectiveness	100%	99%	99%	96%	99%

Similar audits were conducted in 1990, 1992, 1994, 1996, 1998, 2000 and 2002.

Comparison of BMP Audit Results – 2004 With All Previous Audits

Category	2004	2002	2000	1998	1996	1994	1992	1990
Application of practices that meet or exceed BMP requirements.	97%	96%	96%	94%	92%	91%	87%	78%
Application of high risk practices that meet or exceed BMP requirements.	89%	90%	92%	84%	81%	79%	72%	53%
Number of sites with at least one major departure in BMP application.	5 of 39 (13%)	10 of 43 (23%)	4 of 42 (10%)	8 of 47 (17%)	12 of 44 (27%)	17 of 46 (37%)	20 of 46 (43%)	27 of 44 (61%)
Average number of departures in BMP application, per site.	1.3	1.8	1.4	2	3	3.9	5.6	9
Percentage of practices providing adequate protection.	99%	97%	98%	96%	94%	93%	90%	80%
Percentage of high risk practices providing adequate protection.	95%	92%	93%	89%	86%	83%	77%	58%
Number of sites having at least one major/ temporary or minor/prolonged impacts.	10 of 39 (25%)	15 of 43 (35%)	9 of 42 (21%)	12 of 47 (26%)	15 of 44 (34%)	13 of 46 (28%)	17 of 46 (37%)	28 of 44 (64%)
Average number of impacts per site.	0.56	1.3	1	1.5	2.3	3	4.6	8

INTRODUCTION

The forest lands of Montana are also the headwaters for several major river basins and produce large quantities of high quality water. This water nurtures some of the West's best fisheries and is used for irrigation and livestock, as well as for domestic, recreational and industrial purposes. These same lands grow the timber resources that sustain the forest products industry, one of Montana's major industries. All products from Montana's 22.5 million acres of forested land contribute in an essential manner to Montana's economy and way of life.

Montana's water quality protection program for forestry involves a combination of regulatory and non-regulatory approaches. Since the 1970's, non-regulatory Forestry Best Management Practices have provided guidance as minimum water quality protection standards for forestry operations. In 1987 Congress amended the Clean Water Act and added Section 319 to address non-point sources of pollution. Section 319 directed all states to develop non-point source pollution plans to address non-point source pollution problems.

At this same time, concern over the impacts of forest management on Montana's watersheds prompted the 1987 Montana Legislature to pass House Joint Resolution 49. This resolution directed the Montana Environmental Quality Council (EQC) to study "how current forest management practices are affecting watersheds in Montana." (Zackheim, 1988) The EQC established a BMP technical committee that developed Montana's first statewide forestry BMPs in 1987. In 1989, after two years of work, an interdisciplinary working group (BMP Working Group) released the revised Forestry Best Management Practices. Since that time, the BMP Work Group has overseen the biennial process. In the interim between the 1996, 1998, 2000 and 2002 audit cycles the BMP Work Group reviewed and revised the 1989 BMPs. The 2004 version of the Best Management Practices For Forestry In Montana were used in the 2004 audits. (See Appendix A for the complete 2004 BMPs.)

Forestry BMP audits have been conducted previously in Montana. As part of HJR-49, audit teams conducted the first statewide assessment of forest practices for BMPs during the summer of 1988 (Zackheim, 1988). In 1989 the University of Montana, under the Flathead Basin Water Quality and Fisheries Cooperative, audited more sites for BMPs in the Flathead River drainage (Ehinger and Potts, 1990). The Montana Legislature has directed DNRC to conduct further series of statewide BMP audits in 1990, 1992, 1994, 1996, 1998, 2000 and 2002 (Schultz, 1990 and 1992; Frank, 1994; Mathieus, 1996; Fortunate, et al., 1998; Ethridge and Heffernan, 2000; Ethridge, 2002).

Forestry BMPs, if properly applied, can limit non-point source pollution--the kind of diffuse pollution that forestry operations can produce, such as sediment from a road or timber harvest. The BMP audit process has been consistently used since 1990 to evaluate whether BMPs are being properly applied and if they are effectively limiting non-point source pollution.

Prior to 1989, forestry water quality was addressed through a voluntary approach as part of the State's 1988 non-point source assessment and management plan. In 1989 the Montana Legislature enacted the BMP Notification Law (76-13-101 MCA), which requires private landowners to notify DNRC prior to harvesting timber. DNRC then provides information and technical assistance on how to apply BMPs in the logging operation. Under this law, forestry

BMP information is sent to landowners. Implementation of Forestry BMPs is administered within a non-regulatory framework.

Since October 1991 the Streamside Management Zone (SMZ) Law (77-5-301 307 MCA) has regulated forest practices along streams. This law prohibits certain forest practices along stream channels and directs suitable streamside management practices. The SMZ rules (36.11.301 - 310 ARM) became effective March 15, 1993 and were intended to help define and clarify the SMZ law. The 1992 BMP audits did not evaluate compliance with the SMZ law because most operations audited were completed prior to the effective date of the rules. Beginning in 1994, the audits were designed to provide information on the application and implementation of the SMZ law and rules, using a supplemental SMZ questionnaire. In 1998 the format and five-point scale used to evaluate the BMPs for application and effectiveness was adopted for evaluating application and effectiveness of the SMZ law and rules.

The BMP audit process, which the EPA calls BMP implementation monitoring, is a widely used means of evaluating forest practices. Implementation monitoring is an acceptable surrogate for water quality monitoring, a more quantitative, time consuming and expensive approach. Water quality varies naturally due to variable geology, landforms, soils, and climatic events. Due to this variability, investigators have to collect large numbers of samples over a long period of time to accurately characterize water quality.

In Montana investigators use qualitative implementation audits to find out if BMPs are being applied and whether they are controlling erosion. Since BMPs are recognized by state and federal legislation as a method to control non-point source pollution, it makes sense to check the application and effectiveness of BMPs as part of such a program. States are increasingly relying on qualitative surveys, using interdisciplinary teams to assess forest practices on-site to monitor their silvicultural non-point source control programs (NCASI, 1988). California, Idaho, Oregon, Utah, Minnesota, Washington, South Carolina, Texas, and Florida all use a similar qualitative approach to assess the control of non-point source pollution from forest practices.

Montana, through the DNRC, has appointed a technical work group that has overseen the BMP process since its inception and provides recommendations to DNRC. The work group members represent a broad range of interests in forestry in Montana. Several members also serve on the audit teams, and many have been involved with the program since 1988.

In 2003 the Montana Department of Natural Resources and Conservation (DNRC) Forestry Division was once again requested to evaluate forest practices for BMP implementation and report to the EQC before the 2005 legislative session. This report summarizes the findings of Montana's 2004 forestry BMP audits.

METHODS

Objectives

BMP audits have been conducted every two years beginning in 1990; 2004 represents the eighth cycle. The 2004 audits were conducted with similar objectives and criteria as the previous audits in order to produce comparable results.

In 2004, the objectives of the BMP field audits were to:

1. Determine if BMPs are being applied on timber harvest operations.

2. Evaluate the general effectiveness of BMPs in protecting soil and water resources.

3. Provide information on the implementation of the SMZ law and rules and assess general effectiveness of SMZs in protecting water quality.

4. Provide information to focus future educational or study efforts by identifying subjects and geographic areas in need of further attention or investigation.

5. Provide information on the need to revise, clarify, or strengthen BMPs.

The Study Area

The State of Montana is the study area. For 2004 the state was broken into three geographical regions, Northwest, West, and Eastern (Appendix B). For administrative ease, the regional breaks are located on county lines.

Sample Size And Distribution

Historically the target for the number of sites to be audited was set at 45. This number was based on the interaction between the number of days volunteer audit team members could be expected to commit to the audit process and the number of audits a team could reasonably conduct in one day. The maximum time commitment for audit team members was established at 10 days. This is for all audit-related activities, which includes calibration training, conducting the audits and a post-audit critique workshop. It was determined that a request exceeding 10 days would likely jeopardize the ability of individuals to participate, thus restricting the ability to field the desired number of fully-staffed teams. An audit team can be expected to complete one or two audits per day depending on the regional distribution of sites and the travel time between sites. Based on the above expectations and assumptions, the target number of audits was set at 45.

The targeted 45 audit sites are distributed across the state by geographical region (see Study Area above) and land ownership group. The audit process recognizes four ownership groups: State of Montana Trust Lands (DNRC), U.S. Forest Service/Bureau of Land Management lands (Federal), private industrial lands (Industry) and non-industrial private forest lands (NIPF). The basis for audit site distribution is the proportion of the total statewide harvest volume that is harvested within each region by each ownership group. The 45 audit sites are allocated

proportionally among the regions. Harvest volumes were obtained from the 2002 State of Montana Cut By County Report and USFS, BLM and DNRC annual harvest volume records.

A total of 39 sites were audited during the 2004 BMP audits (see Table 1 for historical site information). This number is lower than the generally targeted goal of 45 sites. Three sites selected during the screening process were eliminated after commencement of the audits. Two NIPF sites whose landowners had committed to an audit changed their minds when the team leader called to finalize the audit date, and in a third instance the team was not able to obtain permission to cross all the private lands necessary to reach a DNRC audit site. In general, it has become increasingly difficult to obtain the desired number of NIPF audit sites. Fewer NIPF sites are meeting the minimum and higher priority criteria (see Site Selection discussion below for criteria details). There seems to be a reduction in the NIPF landowners constructing roads and installing stream-crossing culverts. This can reduce the number of NIPF sites meeting the minimum criteria.

The 39 sites are a representative sample of logging operations conducted in Montana since 2001 **that meet specific selection criteria** (see Site Selection, below). The selection criteria restrict the sample to those sites where on the ground timber harvest and timber management-related activities have the greatest opportunity to impact water quality.

Table 1
Historical Number of Sites Audited by Ownership Group

Ownership Group	2004	2002	2000	1998	1996	1994	1992	1990
DNRC	4	5	5	5	5	5	5	5
Federal	9	5	9	12	12	14	16	16
Industrial	19	21	18	18	14	14	16	16
NIPF	7	12	10	12	13	13	9	7
Total	39	43	42	47	44	46	46	44

See Appendix C for the list of audited sites.

Site Selection

In November of 2003 DNRC sent Industry, Federal and DNRC ownership group representatives a letter requesting potential BMP audit candidate sites. Each letter included a BMP Audit Site Information Form (see Appendix D) to be completed for each harvest operation that met the initial selection criteria (see page 6). Members of these ownership groups were very cooperative and provided essential information to DNRC. To obtain potential audit site information for NIPF ownership, DNRC searched its Hazard Reduction Agreements database and consulted with DNRC field service foresters for sites that met the initial criteria.

Minimum criteria for a potential audit sites:

- Timber harvest must have occurred during the years 2001, 2002 or 2003,
- A portion of the sale must be located within 200 feet of a stream,
- The target size for harvest units to be included in the audit process was five acres or greater, and
- The target timber harvest removal was 5,000 board feet (5 MBF) per acre or greater for west-side harvests and 3 MBF or greater for east side harvest.

The site selection objective is to receive a minimum of five potential audit sites from each ownership group in each region (this would not apply if the ownership group did not own land in a specific region). If, through using the minimum criteria, at least five potential audit sites are not generated, the landowner would move to the second and third tiers until five sites can be submitted. Landowners must submit **all** sites that meet the minimum criteria.

Second Tier

- Sites harvested within three years prior to the audit,
- Target size for harvest units 5 acres or greater,
- Minimum size and volume per acre:
  - West-side sites – 5 acres with 3,000 or more board feet per acre removed
  - East-side sites – 5 acres with 1,500 or more board feet per acre removed, and
- A harvest unit must be within 200 feet of a stream (SMZ definition of a stream).

Third Tier

- Sites harvested within three years prior to the audit,
- Target harvest unit size 5 acres or greater,
- Minimum size and volume per acre:
  - West-side sites – 5 acres with 5,000 or more board feet per acre removed
  - East-side sites – 5 acres with 3,000 or more board feet per acre removed, and
- Road system has stream crossings located on the ownership groups property within the audited project area.

Sites that met the initial criteria were further stratified into seven prioritized groups depending on the forest management-related activities conducted at the site. The intent of this stratification was to maximize the number of BMPs evaluated. These groups were as follows:

- Priority 1 - Riparian harvest, new road construction or reconstruction, stream crossing culvert installation and slash disposal complete.
- Priority 2 - Stream within 200 feet of a harvest unit, new road construction or reconstruction, stream crossing culvert installation, slash disposal complete.
- Priority 3 - Stream within 200 feet of a harvest unit, new road construction or reconstruction, stream crossing culvert installation, slash disposal incomplete.
- Priority 4 - Stream within 200 feet of a harvest unit, new road construction or reconstruction, stream crossing without new culvert installation, slash disposal complete.

- Priority 5 - Stream within 200 feet of a harvest unit, new road construction or reconstruction, stream crossing without new culvert installation, slash disposal incomplete.
- Priority 6 - Stream within 200 feet of a harvest unit and slash disposal complete.
- Priority 7 - Stream within 200 feet of a harvest unit and slash disposal incomplete.

Road construction activities must have been conducted during 1998 or later.

Once all potential sites were received, DNRC assigned each site a priority number based on the information supplied on the BMP Audit Site Information Form (Appendix D). Sites were then stratified by Region and Ownership Group. Actual audit sites were then selected by Region and Ownership Group, beginning with Priority 1 sites and progressing through other Priority levels as needed until the targeted distribution was met.

Additional considerations went into final site selection:

- An audit goal is to have two-thirds of the audits located on high hazard sites and one-third located on low to medium hazard sites. High hazard sites are sites with either riparian harvest, harvest within an SMZ, high soil erosion potential, or combinations of these. Erosion hazard was determined using the erosion hazard matrix developed by the Montana Riparian Association (Appendix E). It was believed that the prioritization process would produce this outcome. Table 2 shows the percentage of audited sites that, based on field evaluation, met the high hazard criteria.

- Logistics is also considered as a determinant of the sites selected. Sites of equal priority level could be exchanged to accommodate reasonable team travel.

Table 2
Percentage of Sites Meeting High Hazard Criteria

Ownership Group	Number of Sites	Number of High Risk Sites	Percentage of High Risk Sites	Number of Sites With Riparian Harvest
DNRC	4	3	75%	1
Federal	9	4	44%	4
Industry	19	16	84%	16
NIPF	7	3	43%	2
All Sites	39	26	67%	23

An associated site selection issue is that of access to potential audit sites. BMP audits are voluntary, and thus permission to access a site must be granted by the landowner group or, in the case of NIPF lands, the individual landowner. The DNRC, Federal and Industry ownership groups have all agreed to unrestricted access to BMP audit sites, and access is not an issue. In the case of non-industrial private land, DNRC must obtain permission from each individual landowner prior to conducting an audit on their property. In order to accomplish this, DNRC

made contact by telephone to request permission to audit individual timber harvest sites. If access was granted, a follow-up call was made by the team leader to finalize the audit date.

The sample size and sites selected DO NOT represent a sample of all timber harvest operations in Montana - ONLY those meeting site selection criteria. These selected sites are those where timber harvest is located in proximity to streams and therefore has the greatest potential for non-point source pollution to occur.

The Audit Teams

Three audit teams were formed to conduct the 2004 audits--one for the northwestern, one for the western, one for the central and eastern part of the state. These teams were composed of seven members--a fisheries biologist, a forester, a hydrologist, a conservation group representative, a road engineer, a soil scientist, and a shared position of logging professional or representative of non-industrial private forest landowners (NIPF). A member of each audit team was assigned to lead the team. The team leader was responsible for providing general leadership and direction as well as filling out the official rating form and overseeing the logistics of the team. Team members were employees of federal and state agencies, private industry, conservation organizations, independent consultants, or volunteers.

Two training sessions were conducted prior to the actual audits: one for the Northwest and West teams and one for the East team. These sessions served as a refresher for those with previous experience and as a calibration for new team members. All team members, including alternates, were strongly encouraged to attend one of these sessions. The goal was to have the audit teams establish a consistent method of rating that could carry through the rest of the audits. Team members and alternates met for several hours of classroom instruction on the BMP audit process and then evaluated a sample audit site in the field. The team members shared their results with the other members and identified and discussed their differences and ways to improve overall consistency. See Appendix F for a complete list of team members.

The Rating Form

The 2004 audit teams used a rating form similar to that of previous audits. The guide for rating application and effectiveness was the same as that used in the previous audits. The audit teams evaluated a maximum of 49 BMP practices and 12 SMZ practices at each site. The rating of application and effectiveness for each was done on a five-point scale, as in the past. See Appendix G for a copy of the rating form.

The audit team rated the application of BMPs by first noting if the BMP was applicable to the site and, if so, whether it was applied to the correct technical standard, at the correct frequency, and in the proper locations. The audit teams utilize a decision tree (See Appendix H) to help rate application and effectiveness and, again, to work toward rating consistency.

Lack of adequate application or misapplication are departures from the BMPs. The rating guide for the application of BMPs is:

5 - Operation exceeds requirements of BMP.
4 - Operation meets requirements of BMP.
3 - Minor departure from intent of BMP.
2 - Major departure from intent of BMP.
1 - Gross neglect of BMP.

The following description of the rating guide is adapted from Ehinger & Potts, 1990. The 4 rating is self-explanatory. The 3 rating, minor departure, applies to departures of small magnitude distributed over a localized area, or over a larger area where potential for impact is low. The 2 rating, major departure, applies to departures of large magnitude or to BMPs being repeatedly neglected. The 1 rating, gross neglect, applies where risks to soil and water resources were obvious, yet there was no evidence indicating that operators had applied BMPs to protect these resources. The "5" rating requires explanation. A "5" for Effectiveness is defined by Potts and Ehinger as "Improved protection of soil and water resources over pre-project conditions." Thus, if a BMP is applied adequately and its application leads to improved protection over pre-project conditions, the effectiveness rating for that practice would be a "5." In actuality the Montana audit rating policy does not exactly follow the Potts and Ehinger Effectiveness "5" definition. It was decided that if a BMP practice was applied in such a way that the requirements of the BMP were met, regardless of improvement over pre-existing conditions, this would provide adequate protection and thus receive an effectiveness rating of "4." Effectiveness ratings of "5" are in fact only given if the protection provided is extraordinary or more than adequate; for example, installing a bridge for fish passage when a CMP would have met the BMP requirement or obliterating an unnecessary road rather than merely putting in road drainage or gating the road.

The effectiveness rating addresses how well the application of the applied BMP performed at limiting resource impacts and keeping soil out of water. This rating answers questions concerning impacts; for example, "Has the application or misapplication of a particular forest practice increased the likelihood of, or actual occurrence of, sediment delivery to streams?" Lack of effectiveness results in impacts.

The rating guide for effectiveness was:

5 - Improved protection of soil and water resources over pre-project condition.
4 - Adequate protection of soil and water resources.
3 - Minor and temporary impacts on soil and water resources.
2 - Major and temporary, or minor and prolonged, impacts on soil and water resources.
1 - Major and prolonged impacts on soil and water resources.

The BMP Working Group defined these terms prior to the 1990 audits to help the audit teams use them consistently:

Adequate--Small amounts of material eroded; material does not reach draws, channels, or floodplain.
Minor--Some material erodes and is delivered to draws, but not to stream.

Major--Material erodes and is delivered to stream or annual floodplain.
Temporary--Impacts lasting one year or less; no more than one runoff season.
Prolonged--Impacts lasting more than one year.

Effectiveness ratings of "5" follow the same thinking as for Application. The effectiveness of the applied BMP exceeds what would be necessary to adequately protect soil and water resources.

Occasionally a BMP did not apply on a site. Some sites did not have stream crossings or new road construction; most sites did not have borrow pits; in several instances, slash disposal and site preparation had not been completed. In other cases, the audit team could not rate the BMP at the time of the audit--BMPs having to do with timing of operations during the harvest cannot be judged post-harvest. When these situations occurred, the team noted on the form that the practice did not apply and no rating was given. In 2004, a maximum of 1,911 practices (39 sites, 49 BMPs) could have been rated. 1,528 (80%) practices were rated. Seventy-five percent of all possible SMZ practices were rated (350 of 468).

In addition to the 49 BMPs evaluated, the audit form contains two general questions in Section VII (Appendix G) addressed by the audit team. One questions addresses the issue of overall reductions in sediment delivery to streams as a result of road improvements to existing road systems. The second addresses the third-party road system. See discussions of each question later in this report.

Audit Site Inspections

The teams conduct the audits from late June through early August of 2004. The field routine consists of team members, landowner representatives and observers meeting at a central location prior to each audit. Teams and observers then travel to the audit site. When in the general area of the site, but before actually entering the road system to access the harvest area or the harvest area itself, there is a stop to discuss the specifics of the audit process. The team leader provides maps and audit forms. Usually a representative of the landowner briefs the team by giving background information on the silvicultural prescription, time of operation, and associated practices. The final decisions as to which roads and harvest unit will be audited are then made. All decisions regarding audited roads, SMZs, new culvert installations and harvest units are determined before the team enters the audited road system or harvest area. Once on site, team members walk the site and review BMP practices conducted in the predetermined areas. Teams typically spend about two hours inspecting each site.

After finishing the inspection, but while still at the site, the team gathers to determine BMP ratings. The team leader is charged with leading the discussion and recording the consensus rating for each item on the rating form. For ratings where the team cannot reach a consensus, the team votes and records the rating with the most votes. The team leader notes dissenting opinions in the Comments section. Teams almost always reach a consensus. Observers attending the audits may give feedback when requested, but are not allowed to participate in ratings determination or to lobby for a particular score.

Limitations of the Audit Methods (in part, adapted from Idaho DHW, 1989.)

In analyzing the audit results, readers need to consider the limitations of the techniques used in the audit. The audit technique consists of a one-time field inspection and assessment. This approach documents erosion and sedimentation problems occurring in the first or second years after harvest. This is

generally the critical period for erosion associated with timber harvests. Some practices conducted during harvest cannot easily be evaluated during a post-harvest audit and are not considered during the audit. The assessment is based on visual appraisals of practices and impacts to surface soils and streams. The results are a "snapshot in time" of the practices and subsequent impacts. They do not necessarily reflect future impacts. During the 1998 audits, sites previously audited in 1996 and 1994–i.e., four- to six-year-old sites–were examined for long-term impacts. This information can be found in the 1998 Forestry BMP Audit Report (Fortunate et. al.)

Sites are split among the three teams. Although rating inconsistency between teams should not be overlooked, its effect is likely minor due to the interaction between teams and the continuity of experienced team members. DNRC monitors each team to evaluate and promote consistency.

RESULTS

This section presents the results of the 2004 BMP field audits. Results will be in four parts: BMP Application, BMP Effectiveness, High Risk BMPs, and SMZ Results.

Results will be presented in three formats: summary data for BMP practices (Tables 3 and 6), summary data for audited sites (Tables 4 and 7), and a listing of the specific BMPs that incurred departures and impacts (Tables 5 and 8). For reference, Appendix I presents a summary tabulation of ratings by individual BMP.

Application of BMPs

The application rating measures whether the BMP was applied, whether it was applied to the correct standards, the appropriate number of times and in the proper locations. See "The Rating Form" section on page 9 for further explanation of the application rating. Audit teams rated a total of 1,528 practices to assess how landowners and operators applied BMPs. SMZ practices were rated separately. Tables 3, 4 and 5 present results relevant to BMP Application.

Table 3
Application of BMPs to All Rated Practices
by Ownership Group and Rating Category

		Percentage (%) of Practices Rated As			
Ownership Group	**# Practices Rated**	**Meet or Exceed**	**Minor Departures**	**Major Departures**	**Gross Neglect**
DNRC	173	97%	3%	0%	0%
Federal	354	93%	5%	2%	0%
Industrial	801	99%	<1%	<1%	0%
NIPF	200	94%	6%	0%	0%
All Sites	1,528	97%	3%	<1%	0%

Practices were applied correctly 97 percent of the time (Table 3). In terms of departures, of the 1,528 practices evaluated, 3 percent of the practices had departures; 42 ratings of 3 (minor departures) and 10 ratings of 2 (major departures). There were no ratings of 1 (gross neglect).

Table 4 details the percentage of **sites** with application departures and average number of departures per site. The table shows that 56 percent of the sites audited were producing at least minor departures at an average of 1.1 departures per site. Thirteen percent of all sites were producing major departures--an average of .26 per site. Forty-four percent of the sites had no departures.

Table 4
Audit Sites with Departures from BMP Application and Average Number of Departures per Site

		Percentage of Sites w/out Impacts	Percentage (%) of Sites with Departures			Average Number of Departures Per Site*		
Ownership Group	**Total # of Sites**	**Adequate or Improved Protection**	**Minor**	**Major**	**Gross**	**Minor**	**Major**	**Gross**
DNRC	4	50%	50%	0%	0%	1.25	0.0	0.00
Federal	9	11%	89%	44%	0%	1.9	0.89	0.00
Industrial	19	63%	37%	5%	0%	0.5	0.1	0.00
NIPF	7	29%	71%	0%	0%	1.6	0.0	0.00
All Sites	39	44%	56%	13%	0%	1.1	.26	0.00

* Number of Departures/Total Number of Sites

In Table 4, each category of departures must be considered separately, since a site may have departures in more than one category.

Table 5 identifies the specific BMPs where departures occurred. The list is ordered from most to fewest departures.

Table 5
Individual BMP Practices* Where Application Departures Occurred and a Summary of the Ratings Given

SECTION	BMP SUBSECTION	BMP	2 Rating Departures	3 Rating Departures	Total Departures
III	E	2	0	9	9
III	C	1	2	5	7
III	C	7	2	3	5
IV	B	5	1	2	3
III	C	3	0	2	2
III	C	4	1	1	2
III	C	5	1	1	2
III	D	3	0	2	2
III	D	6	0	2	2
III	E	1	0	2	2
IV	A	5	1	1	2
IV	C	8	0	2	2
V	C	4	0	2	2
III	D	2	0	1	1
III	D	5	0	1	1
III	E	6	1	1	1
IV	B	1B	0	1	1
IV	B	2	0	1	1
V	B	1B	1	1	2
V	C	3	0	1	1
V	D	1	0	1	1
TOTALS			10	42	52

* See Appendix A for a description of individual BMPs.

Effectiveness of BMPs

The effectiveness rating evaluates how well BMPs protected soil and water resources. See page 10 for further explanation of the effectiveness rating. The audit teams evaluated a total of 1,528 practices for effectiveness. Table 6 provides a summary of the effectiveness of all practices audited, by ownership group.

The effectiveness information in Table 6 should be used with thoughtful discretion. While simple percentage ratings may be relatively high for the category Adequate Protection (99 percent), less than adequate effectiveness of an individual BMP will result in impacts.

Adequate protection was provided 99 percent of the time. In terms of impacts (Table 8), of 1,528 practices evaluated, 22 practice departures had impacts; 10 ratings of 3 (minor temporary

impacts) and 9 ratings of 2 (major temporary or minor prolonged impacts), and 3 ratings of 1 (major and prolonged impacts).

Table 6
Effectiveness of BMPs for All Rated Practices
by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated	Percentage (%) of Practices Rated As			
		Adequate Protection	Minor/Temp. Impacts	Major/Temp. Minor/ Prolonged	Major/ Prolonged
DNRC	173	98%	<1%	<1%	0%
Federal	354	96%	2%	2%	<1%
Industrial	801	99%	<1%	<1%	0%
NIPF	200	99%	0%	0%	<1%
All Sites	1,528	99%	<1%	<1%	<1%

Table 7 lists the percentage of sites with impacts and average number of impacts per site. The table shows that 13 percent of the sites audited had at least minor/temporary impacts--an average of .26 per site. Fifteen percent of all sites had major/temporary impacts--an average of .23 per site.

Table 7
Audit Sites with Impacts and Average Number of Impacts per Site

		Percentage (%) of Sites w/out Impacts	Percentage (%) of Sites With Impacts			Average Number of Impacts per Site*		
Ownership Group	Total # of Sites	Adequate or Improved Protection	Minor/ Temp.	Major/Temp. Minor/ Prolonged	Major/ Prolonged	Minor/ Temp.	Major/Temp. Minor/ Prolonged	Major/ Prolonged
DNRC	4	75%	25%	25%	0%	0.5	0.25	0.0
Federal	9	33%	33%	44%	11%	0.6	0.77	0.22
Industrial	19	89%	5%	5%	0%	0.1	0.05	0.0
NIPF	7	86%	0%	0%	14%	0.0	0.0	0.14
All Sites	39	74%	13%	15%	5%	0.26	0.23	0.08

* Number of Impacts/Total Number of Sites

Table 8 identifies the specific BMPs where impacts occurred. The list is ordered from most to fewest departures.

Table 8
Individual BMP Practices* Where Effectiveness Impacts Occurred and a Summary of the Ratings Given

Section	BMP Subsection	BMP	1 Rating	2 Rating	3 Rating	Total Effects Impacts
III	C	7	1	3	0	4
III	C	1	0	2	1	3
III	E	2	0	0	3	3
III	C	5	0	1	1	2
III	D	3	0	1	1	2
V	B	1B	1	0	0	1
V	D	1	0	0	1	1
III	D	5	0	1	0	1
III	C	4	0	1	0	1
IV	B	5	0	0	1	1
V	C	4	1	0	0	1
IV	A	5	0	0	1	1
III	E	6	0	0	1	1
		TOTALS	**3**	**9**	**10**	**22**

*See Appendix A for a description of individual BMPs.

Table 9 provides an overall numeric summary by ownership group of all departures and impacts.

Table 9
Overall Summary of Audited BMP Practices

Practices Information					Application			
Group	**Audited Sites**	**Total Practices Possible ***	**Number Practices Not Rated ****	**Number Practices Rated**	**Exceeds (5)**	**Minor (3)**	**Major (2)**	**Gross Neglect (1)**
DNRC	4	196	23	173	2	5	0	0
Federal	9	442	88	354	7	17	8	0
Industry	19	931	130	801	0	9	2	0
NIPF	7	342	142	200	0	11	0	0
Total	**39**	**1911**	**383**	**1528**	**9**	**42**	**10**	**0**

Effectiveness				
Group	**Exceeds (5)**	**Minor/ Temp (3)**	**Major/Temp Minor/Prolonged (2)**	**Major Prolonged (1)**
DNRC	5	2	1	0
Federal	4	6	7	2
Industry	1	2	1	0
NIPF	0	0	0	1
Totals	**10**	**10**	**9**	**3**

* Total practices possible based on the number of sites audited for each ownership.
** Practices not rated because the practice did not apply to the site. For example there was no new culvert installation.

High Risk BMPs

Simple percentages alone will not give a clear picture of the application and effectiveness of Montana's BMPs. Even a low percentage of misapplied BMPs can still result in major impacts. Additionally, all practices evaluated can affect water quality, but their potential impacts vary greatly. For example, drainage from a skid trail half a mile from a stream may not have as direct an impact on water quality as providing adequate road surface drainage at a stream crossing. In an effort to gain insight regarding the practices with the higher potential to directly impact water quality, eight high risk BMPs have been identified and analyzed separately. They are among the most important for protecting Montana's watersheds. They include:

BMP Number	Practice Description
III.C.1	Provide adequate road surface drainage for all roads.
III.C.7	Route road drainage through adequate filtration zones before entering a stream.
III.D.2	Stabilize erodible soils (i.e., seeding, benching, mulching).
III.E.2	Maintain erosion control features (dips, ditches and culverts functional).
IV.A.5	Design and locate skid trails to avoid concentrating runoff.
IV.B.5	Adequate drainage for temporary roads, skid trails, fire lines.
IV.C.8	Limit water quality impacts of prescribed fire.
V.C.4	Prevent erosion of culvert and bridge fills (i.e., armor inlet and outlet).

The results for application and effectiveness of the eight high risk BMPs are presented in Tables 10 and 11. Table 12 shows a comparison between All BMPs and High Risk BMPs.

Table 10 shows the BMP application for the eight high risk BMPs. The percentage of practices with departures is higher for the high risk group (Table 10) than for all audited practices (Table 3), as shown in Table 12**.**

Table 10
Application of High Risk BMPs
by Ownership Group and Rating Category

		Percent (%) Practices Rated As			
Ownership Group	**# Practices Rated**	**Meet or Exceed**	**Minor Departures**	**Major Departures**	**Gross Neglect**
DNRC	30	87%	13%	0%	0%
Federal	68	82%	12%	6%	0%
Industrial	142	96%	3%	1%	0%
NIPF	45	82%	18%	0%	0%
All Practices	285	89%	9%	2%	0%

Table 11 shows the effectiveness of the eight high risk BMPs. The percent of practices providing adequate protection is lower for the high risk BMPs (Table 11) than for the total BMP results presented in Table 6. The percent of practices resulting in impacts are higher for the high risk BMPs than for practices in general (Table 12).

Table 11
Effectiveness of High Risk BMPs
by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated	Adequate Protection	Minor/Temp. Impacts	Major/Temp. Minor/ Prolonged	Major/ Prolonged
DNRC	30	94%	3%	3%	0%
Federal	68	88%	4%	6%	2%
Industrial	142	99%	1%	0%	0%
NIPF	45	98%	0%	0%	2%
All Practices	285	95%	2%	2%	1%

Table 12
BMP Application and Effectiveness
All vs. High Risk

Application				
BMPs	**Meet or Exceed**	**Minor Departure**	**Major Departure**	**Gross Neglect**
All	97%	3%	<1%	0%
High Risk	89%	9%	2%	0%
Effectiveness				
BMPs	**Meet or Exceed**	**Minor Departure**	**Major Departure**	**Gross Neglect**
All	99%	<1%	<1%	<1%
High Risk	95%	2%	2%	1%

Streamside Management Zones

There is a somewhat different purpose in auditing SMZ rules compared to BMP practices. They both are designed to protect water quality. However, auditing SMZ law activities is a non-regulatory look at SMZ rules compliance, whereas BMPs are, by definition, non-regulatory.

The SMZ rating form used in 2004 (last page of Appendix G) was slightly different from the 2002 audit form. In past forms there were two data entry points for Alternative Practices requiring only a yes/no entry. In 2004 those entries were modified to accept application and effectiveness ratings. In 2004 a maximum of 12 practices were rated on each site. The practices

rated were taken from the SMZ rules. The scoring was the same as the 49 BMP practices with a five-point rating scale. **These ratings did not constitute an investigation or a DNRC enforcement action, nor were they used as a basis for future enforcement actions**. Audit team members evaluated departures based on their best professional judgment.

The SMZ law and rules were applicable to all 39 sites. Harvest of trees within riparian areas (not necessarily the SMZ) occurred on 23 of the 39 sites (Table 2). On six of the sites evaluated, four pre-approved alternative practices, as allowed under the SMZ Rules, and four DNRC-approved, site-specific alternative practices were utilized.

A total of 8 SMZ departures were noted on 6 of the 39 sites evaluated. These numbers represent a reduction when compared to the 2002 audit results (Table 13). A total of 350 SMZ evaluations were made. SMZ rules were applied correctly 98 percent of the time. Of the 8 departures, 3 had no impacts, 4 had minor impacts and 1 had a major impact (Table 15).

Table 13
SMZ Departures by Ownership Group

Ownership Group	Number of Sites Evaluated		Number of Sites With Departures		Total Number of Departures	
	2004	2002	2004	2002	2004	2002
DNRC	4	5	0	0	0	0
Federal	9	5	1	0	1	0
Industrial	19	21	3	1	3	2
NIPF	7	12	2	3	4	4
All Sites	39	43	6	4	8	6

See Table 14 for the summary and comparison of SMZ departures by practice.

Table 14

SMZ Application Departures by Practice

Practice	# Departures
SMZ Width Maintained	1
Equipment Operation in SMZ	1
SMZ Maintained/Properly Marked	3
Side-casting into Stream	1
Adequate Retention of Trees	1
Exclusion of Road Fill Material Deposited In SMZ	1
TOTAL	**8**

Table 15 provides a summary of application departures and effects.

Table 15
Summary of SMZ Departures and Effects

Application			Effectiveness		
Number of Departures	**Minor Departures (3)**	**Major Departures (2)**	**Number of Impacts**	**Minor/Temp. (3)**	**Major/Temp Minor/Prolonged (2)**
8	6	2	5	4	1

SMZ effectiveness was very high, over 99 percent for all ownerships combined. Of the 350 SMZ evaluations, 345 provided adequate protection, only one of the impacts being rated as a two (2), Major/Temporary or Minor Prolonged.

SMZ Width

In all cases but one the SMZ width met or exceeded the requirements of the SMZ law. The one case where the SMZ was not maintained was not a direct result of the landowner or logger not adhering to the law. DNRC Service Foresters had inspected the site at the landowner's request prior to harvest to determine if a SMZ existed at the site. At the time there were two isolated wetlands in a large grassy meadow with no evidence of a stream. The Service Forester determined that no SMZ was present and only the isolated wetland requirements of the SMZ law pertained. During the summer of 2004, however, considerable rainfall occurred at the site. When the audit team arrived they found the two isolated wetlands had become ponds with a small connecting stream. Because the BMP audits evaluate the site based on the conditions at the time of the audit, the presence of the SMZ was considered part of the audit for consistency and departures were recorded. The impacts associated with these departures were rated as three (3), Minor.

In three cases SMZs were not adequately marked. One of the sites is the same listed in the previous paragraph. At the other two sites the SMZ width was marked at less than the proper width; however, no prohibited practices were conducted within the correct SMZ width. Thus, even though the SMZs were not correctly located on the ground, the SMZ width where operations are restricted were maintained.

There were four SMZs requiring a 100-foot width. The maximum width measured was 200 feet; the minimum was 100 feet with an average of 111 feet. Considering SMZs requiring a 50-foot SMZ, the maximum was 170 feet, the minimum was 0 feet (where the SMZ was not recognized as present as discussed above), and the average was 67 feet.

DISCUSSION

Application Across All Ownerships

Ninety-seven percent of the practices rated were properly applied according to BMP standards (Table 3). This percentage represent a slight increase above the 2002 percentage of 96 percent and maintains the improvement over all audits prior to 2002 (Table 16). The high application compliance percentage demonstrates the strong commitment all ownership groups have to BMPs.

Effectiveness Across All Ownerships

Ninety-nine percent of all applied BMP's were shown to be effective in preventing sediments from reaching draws or streams. The low percentage was 96 percent on Federal lands and the high was 99 percent on both Industrial and NIPF. These numbers represent a 2 percent increase in overall effectiveness from the 2002 results. Beyond the overall percentage, the range of effectiveness has improved significantly from a low of 89 percent and a high of 99 percent.

The most frequent departures and impacts were associated with road maintenance and road surface drainage. The following list ranks rated BMPs by the sum of departures and impacts. Practice III.E.2 is ranked #1 because it had more total departures and impacts than any other practice. A (--) indicates departures and impacts were not frequent enough to be in the top list for that year. Ties indicate BMPs with equal number of departures/impacts. See Appendix J for a listing of all BMP's where departures and impacts were recorded and the number of departures and impacts identified.

Practice #	BMP Description	2004	2002	2000	1998	1996	1994	1992	1990
III. E. 2 *	Maintain erosion control features (dips, ditches and culverts functional).	1	3	6	3	5	5	--	10
III. C. 1 *	Provide adequate road surface drainage for all roads	2	1	1	1	1	1	3	1
III. C. 7 *	Route road drainage through adequate filtration zones before entering a stream	3	2	3	2	7	2	2	
III.D.3	Effective sediment control on erodible fill slopes.	4	5	--	--	--	--	--	--
IV.B.5*	Adequate drainage for skid trails	4	--	--	--	--	--	--	--
III. C. 5	Provide energy dissipaters at drainage structure outlets where needed.	4	6	7	4	14	11	--	--
V.B.1b	Direct road drainage away from stream crossing site.	5	2	2	5	3	3	13	19
III.C.4	Install road drainage culverts at original gradient and rock armor or anchor downspouts	5	6	7	4	14	11	--	--
V.C.4*	Prevent erosion of stream crossing culverts and bridge fills.	5	--	--	--	--	--	--	--
IV.A.5*	Design and locate skid trails to avoid concentrating runoff.	5	--	--	--	--	--	--	--
III.E.6	Avoid using roads during wet periods and spring breakup	5	--	--	--	--	--	--	--

* Indicates "High Risk" BMPs.

The top three BMPs on the above list account for 42 percent of all departures and impacts. It can also be seen from this listing that generally the top three for 2004 also rank toward the top of the list over all audit years.

The practices listed above accounted for 70 percent of all departures and 86 percent of all impacts. The 22 remaining BMPs where departures or impacts occurred had 2 or less departures plus impacts. Of 49 practices rated, 18 had zero departures or impacts. All high risk BMPs had at least one departure.

It is also interesting to observe the number of practices listed above that made the list for the first time. This is a direct result of the very small total number of departures and impacts recorded in the 2004 audits. A review of Appendix J shows that the bottom five BMPs listed above each had only a combined total of three departures and impacts. The Audit Report generally lists the top 10 to 12 BMPs with the highest number of departures and impacts. Previous audit reports have gotten 10 to 12 without getting to such a low number. It is not that these BMPs have not had

impacts or departures in the past; this is the first year that a BMP with so few departures and impacts made the list.

Combining application and effectiveness, the 2004 audits rated a total of 3,056 practices across all 39 audited sites. There were a combined total of 74 ratings with a departure or impact. **A departure or an impact occurred on less than 2 percent of all practices rated.** See Appendix J for a ranked summary of all departures and impacts by BMP for the 2004 audits.

An interesting question concerns the effectiveness rate of an application departure. When a BMP received an application rating of 3 (minor departure from BMP), 58 percent of the time the corresponding effectiveness rating was 4 (adequate protection), 19 percent of the time the corresponding effectiveness rating was 3 (minor temporary impacts), 17 percent of the time a 2 (major temporary or minor prolonged impacts) and 6 percent of the time a 1 (major and prolonged).

Comparisons with Previous Audits

See Tables 16 and 17 for a general comparison of audit results.

The 2004 results show an overall improvement in results when compared to previous years. The only decrease was in High Risk Application: a slight decrease from 90 percent to 89 percent. High Risk Effectiveness increased from 92 percent to 95 percent, indicating that the slight decrease in High Risk Application did not result in an increase in impacts to water resources. For additional comparison details, see Appendix K.

Table 16
Comparison of BMP Audit Results With Previous Audits

Category	2004	2002	2000	1998	1996	1994	1992	1990
Application of practices that meet or exceed BMP requirements.	97%	96%	96%	94%	92%	91%	87%	78%
Application of high risk practices that meet or exceed BMP requirements.	89%	90%	92%	84%	81%	79%	72%	53%
Number of sites with at least one major departure in BMP application.	5 of 39 (13%)	10 of 43 (23%)	4 of 42 (10%)	8 of 47 (17%)	12 of 44 (27%)	17 of 46 (37%)	20 of 46 (43%)	27 of 44 (61%)
Average number of departures in BMP application, per site.	1.3	1.8	1.4	2	3	3.9	5.6	9
Percentage of practices providing adequate protection.	99%	97%	98%	96%	94%	93%	90%	80%

Category	2004	2002	2000	1998	1996	1994	1992	1990
Percentage of high risk practices providing adequate protection.	95%	92%	93%	89%	86%	83%	77%	58%
Number of sites having at least one major/temporary or minor/prolonged impacts.	10 of 39 (25%)	15 of 43 (35%)	9 of 42 (21%)	12 of 47 (26%)	15 of 44 (34%)	13 of 46 (28%)	17 of 46 (37%)	28 of 44 (64%)
Average number of impacts per site.	0.56	1.3	1	1.5	2.3	3	4.6	8

Results by Ownership Group

2004 Audit results across all ownership groups were 93% or above for all BMP and SMZ categories (Table 18). Across all ownership 3,406 ratings were made (3,056 BMP and 350 SMZ) with a total of 87 departures and effects (74 BMP and 13 SMZ) for an overall compliance rating of 99 percent. These results are an improvement over the 2002 results.

Given that all ownership groups demonstrated excellent overall compliance at the sites audited in 2004, there are some general observations that can be made for each. See Tables 9 and 17 and Appendix K for ownership comparison tables.

DNRC

All DNRC 2004 Audit results were at 97 percent or above. Given this, DNRC did show a slight decrease in BMP results from 2002 audits. Application and Effectiveness were down by 1 percent each with very slight decreases in specific departures and effects per site. SMZ results remained the same at 100 percent for both Application and Effectiveness.

Table 17
Summarized Audit Site Results 1990 Through 2004

		1990	1992	1994	1996	1998	2000	2002	2004
Application	Meets/Exceeds	78%	87%	91%	92%	94%	96%	96%	97%
	Minor Departures	14%	8%	7%	7%	5%	3%	3%	3%
	Major Departures	8%	4%	3%	1%	1%	0.3%	1%	<1%
Effectiveness	Adequate Protection	80%	90%	93%	94%	96%	98%	97%	99%
	Minor Impacts	11%	6%	5%	4%	3%	2%	1%	<1%
	Major Impacts	8%	4%	2%	2%	1%	.07%	2%	<1
% Sites	With Major Departures	61%	43%	37%	27%	17%	10%	23%	13%
	With Major Impacts	64%	37%	28%	34%	26%	21%	35%	15%
Average Departures	Minor Per Site	5.5	3.7	2.7	2.5	1.7	1.3	1.4	1.1
	Major Per Site	2.5	1.4	1.1	0.55	0.34	0.12	0.39	0.26
Average Impacts	Minor Per Site	4.4	2.8	2.1	1.6	1	0.71	0.58	0.26
	Major Per Site	3.0	1.4	0.8	0.66	0.51	0.29	0.75	0.31

Federal

All Federal sites were from the U.S. Forest Service. The Forest Service scores were all 93 percent and above. Their scores showed marked improvement from 2002 scores, increasing Application from 89 percent to 93 percent and Effectiveness from 89 percent to 96 percent. Given this improvement, the Forest Service had the largest number of departures and impacts of all ownership groups and the largest number of Major impacts and effects. They also had the largest number of five (5) ratings, Exceeds Requirements (Table 9). Federal SMZ scores showed a slight decrease from 100 percent to 99 percent for both Application and Effectiveness.]

Industry

Industry scored either 98 percent or 99 percent in all categories. Industry had a mix of very slight increases and decreases from 2002 scores depending on the criteria being evaluated. Decreases were noted in the percentage of sites with minor departures, average departures per site and minor and major impacts per site. Industry had a one (1) percent increase in the percentage of sites with major departures. Industry showed a slight decrease in SMZ scores in Application and Effectiveness, from 99 percent and 100 percent to 98 percent and 99 percent respectively.

Non-Industrial Private Forest Landowners (NIPF)

NIPF sites showed improvement in BMP scores in 2004. Application and Effectiveness improved from 92 percent and 95 percent to 94 percent and 99 percent respectively. NIPF sites had only 11 departures (all Minor) and 1 impact (Major and Prolonged) from 342 rated practices. NIPF sites showed reductions in percentage of sites with departures and impacts and in the number of departures and impacts per site. NIPF sites did show a decrease in SMZ scores. Much of this was due to the scores at the NIPF site where SMZ developed as a result of increased precipitation following harvest; as described in the SMZ Results section.

Table 18
Ownership Results Comparison 2002 and 2004

Practice	DNRC		Federal		Industry		NIPF		Totals	
	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002
BMP APPLICATION	97%	98%	93%	89%	99%	98%	94%	92%	97%	96%
BMP EFFECTIVENESS	98%	99%	96%	89%	99%	99%	99%	95%	99%	97%
SMZ APPLICATION	100%	100%	99%	100%	98%	99%	92%	97%	98%	99%
SMZ EFFECTIVENESS	100%	100%	99%	100%	99%	100%	96%	99%	99%	99%

Third Party Road And Grazing Implications

Audit team members noted a range of water quality impacts not resulting directly from the audited timber sale. Both grazing and third party road impacts were observed at several audit sites. **Grazing** was noted as being especially significant in impacting water quality. Teams noted that in at least one case grazing impacts in a stream channel created difficulties in rating the applicable BMPs. It was difficult to tell if the BMP was adequately applied because grazing

impacts had removed the evidence indicating the level of original application. **Third-party roads** are roads not owned or directly controlled by the audited party. Because the roads are not under the direct control of the audited landowner third party roads are not rated in the audit process. In order to qualitatively monitor BMPs associated with third party roads there is a location in Section VII of the audit form (Appendix G) where teams can record observations regarding third party roads. Several situations were noted where impacts were occurring because either roads were not adequately maintained by the road owner or roads were being used for another purpose, and that non-audit activity was causing impacts. Of the 39 sites audited, 9 identified third party roads. Of the nine, three third party roads had BMP departures noted. Of the three, none had departures that resulted in direct delivery to streams.

Reductions In Overall Sediment Delivery

Following the 1998 BMP audits, several members of the BMP Audit Technical Working Group (TWG) expressed a concern regarding the policy regarding awarding "5" ratings for BMP Effectiveness (see page 9, Rating Form). They believed the current policy may result in obscuring recognition of actual reductions in sediment delivery to streams when compared to pre-project conditions, and that these reductions in sediment are the result of improved protection to soil and water resources due to adequately applying BMPs.

As detailed in the discussion of the Rating Form beginning on page 9, a "5" for Effectiveness is considered to be extraordinary or more than adequate; for example, installing a bridge for fish passage when a CMP would have met the BMP requirement. It was pointed out that due to this rating policy, there may be and probably are projects where application of BMPs has resulted in on-the-ground conditions being brought up to BMP standards and resulting in reduced sediment delivery over pre-project conditions. If this is taking place the rating policy is obscuring this improvement.

The question was asked as to how this could be evaluated and the results presented in the Audit Report. The BMP Technical Working Group decided to add a new question to the BMP Audit Form (Appendix G). This new Yes/No question is found in Section VII of the Audit Form and reads, "Project included road improvements to existing road system that reduced overall sediment delivery to streams." The teams were asked to do a visual qualitative assessment of each audited project's post-project road system and, when possible, determine if improvements resulted in a reduction in sediment delivery to streams. The 2004 audit results for this question are provided in Table 19.

Table 19
Overall Sediment Reduction Over Pre-Project Condition

Landowner	# Sites Audited	# Sites Applicable	Number Yes	Number No
DNRC	4	4	4	0
FEDERAL	9	9	8	1
INDUSTRY	19	19	12	7
NIPF	7	7	3	4
TOTALS	39	39	28	12

Results indicate that at 72 percent of the applicable audit sites, sediment delivery to streams from existing roads has been reduced over pre-project conditions. An existing road system was in place prior to project commencement, and some sedimentation was occurring. During the course of the project BMPs were implemented or brought up to BMP standards such that sediment delivery to draws or streams was reduced. A "No" response indicated that there were no opportunities to reduce sediment on existing roads. This would have been because there were either no preexisting roads or because BMPs had already been applied to the existing road system and were adequately functioning. "NA" would indicate that there were no existing roads associated with the project.

Existing roads are defined as road systems in place prior to commencement of activities on the audited project. This question did not apply to project areas where roads were not in place prior to commencement of activities on the audited project.

It should be noted that a "Yes" determination does not necessarily mean that there was no sediment delivery occurring post-project. A "Yes" indicates that the current status regarding delivery has been improved over pre-project conditions. Likewise, a "No" determination does not mean that conditions have worsened, nor that no improvements were made to the existing road system. A "No" indicates that any improvements made did not lead to reductions over pre-project conditions.

CONCLUSIONS

This final section will provide concluding remarks. The remarks will focus on addressing the objectives of the Best Management Practices audits as outlined on page 5.

Determine if BMPs are being applied on timber harvest operations.

Regarding high risk sites, it can be conclusively stated that audited BMPs are being applied and applied correctly at a very high rate. There were no sites audited where evidence of BMP application was not present. BMPs are well established as the Montana forestry standard for timber harvest practices.

Evaluate the general effectiveness of BMPs in protecting soil and water resources.

Conclusions drawn from audit results over the past 12 years are very consistent and straightforward; when BMPs are applied correctly, they are very effective in the protection of soil and water resources.

Provide information on the implementation of the SMZ law and rules and evaluate the general effectiveness of SMZs in protecting water quality.

The 2004 audit data continues to show that the SMZ law and rules are being applied across the state. These results are consistent with DNRC's enforcement program. DNRC enforcement records show that the law and rule violations across the state are generally few and that the impacts associated with these violations are generally minor and easily repairable. The 2004 audit data continues to support the contention that SMZ law and rules are effective in protecting water quality with regards to the prohibited practices.

Provide information to focus future educational or study efforts by identifying subjects and geographic areas in need of further attention or investigation.

A list of top priority issues or subject areas and recommendations for education and information are as follows.

- Continue efforts to address fisheries issues and Total Maximum Daily Load (TMDL). Discern and educate regarding the proper technical applications and criteria to evaluate fish in relation to water quality.

- Work with Conservation Districts, county road maintenance programs, and other water quality-related parties to communicate the big picture of BMPs and how we can interact for the improvement of water quality.

- Continue education and information sharing on road maintenance and road surface drainage issues. They continue to be the source of the majority of BMP departures.

- Reach more woods workers and especially NIPF landowners regarding BMPs and the SMZ Law and Rules.

- Conduct informational presentations of SMZ law and rule and BMPs and BMP process in university classes.

- Continue the relationship and educational efforts of DNRC and the Montana Logging Association in providing workshops for woods workers.

- Continue to work with audit team members in meeting their needs for information and clarification of audit issues and continue to present that information during the audit calibration audits.

Provide information on the need to revise, clarify or strengthen BMPs.

Audit team leaders and team members met on September 21, 2004 to discuss the 2004 field audits and the audit process in general. Team members who could not attend were invited to submit verbal or written comments. The September 21th meeting resulted in a list of concerns, requests and recommendations for the BMP Audit Technical Working Group. The BMP Technical Working Group (TWG) will meet in late 2004 or early 2005 to consider the concerns and recommendations generated by the audit team members.

What follows is a summary of the recommendations and requests submitted by audit team members to the TWG. For a complete text of either meeting's minutes, contact the Montana Department of Natural Resources and Conservation, Service Forestry Bureau, in Missoula, MT.

- The BMP Audits be continued and the next audits occur in the year 2006.

- The efforts to address fish passage must continue. The 2004 fish passage measurement pilot project data and recommendations for the team members needs to be passed on to the Fish Passage Sub Working Group for analysis and a report to the BMP Working Group for a decision as to the next step.

- NIPF site selection continues to be problematic at times. Two NIPF landowners declined access at the last minute and reduced the number of audited NIPF sites. Additionally, because of the voluntary nature of the audits and the resulting NIPF landowner-by-landowner permission process, we may not be getting an adequate audit site sample.

- There was a difficulty filling four audit teams for the 2004 audits. There was a difficulty obtaining membership from several of the team disciplines. Because of this difficulty, there were only three teams this year. The team members attending the Post Audit Team Meeting felt this was an adequate number and recommend the Working Group reduce the official number of teams to three.

- Increased effort should be made to get contractors and administrators to audits. When DNRC is contacting potential audit site landowners they should ask for the names of

loggers, consultants, purchasers, contract administrators and the like. This information should be placed on the Team Leader contact list.

- Reaffirm with all Agency and Industrial landowner participants the importance of establishing a local person who is responsible and accountable for implementation of BMPs on all projects conducted within their area

- After finding a minor oil spill on a landing, the auditing team realized they were not sure what the appropriate response to the hazardous materials question should be. The Working Group should investigate this question and consider additional guidance to the teams.

- Several improvements, clarifications and corrections were suggested for the Audit Form and should be considered by the Working Group.

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APPENDIX A

BEST MANAGEMENT PRACTICES FOR FORESTRY IN MONTANA

January 2004
* BMPs Not Monitored During Audits
# BMPs Edited in 2004

DEFINITIONS

1. "Hazardous or toxic material" means substances which by their nature are dangerous to handle or dispose of, or a potential environmental contaminant, and includes petroleum products, pesticides, herbicides, chemicals, and biological wastes.

2. "Stream," as defined in 77-5-302(7), MCA, means a natural water course of perceptible extent that has a generally sandy or rocky bottom or definite banks and that confines and conducts continuously or intermittently flowing water.

3. "Streamside Management Zone (SMZ)" or "zone" as defined at 77-5-302(8), MCA means "the stream, lake, or other body of water and an adjacent area of varying width where management practices that might affect wildlife habitat or water quality, fish, or other aquatic resources need to be modified." The streamside management zone encompasses a strip at least 50 feet wide on each side of a stream, lake, or other body of water, measured from the ordinary high water mark, and extends beyond the high water mark to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils.

4. "Wetlands" mean those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and similar areas.

5. Adjacent wetlands are wetlands within or adjoining the SMZ boundary. They are regulated under the SMZ law.

6. Isolated wetlands lie within the area of operation, outside of the SMZ boundary, and are not regulated under the SMZ law.

II. STREAMSIDE MANAGEMENT

The Streamside Management Law (77-5-301 through 307 MCA) provides minimum regulatory standards for forest practices in streamside management zones (SMZ). The "Montana Guide to the Streamside Management Zone & Rules" is an excellent information source describing management opportunities and limitations within SMZs.

III. ROADS

A. Planning and Location

1. Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads, unless use of such roads would cause or aggravate an erosion problem.

2. Review available information and consult with professionals as necessary to help identify erodible soils and unstable areas, and to locate appropriate road surface materials.*

3. Fit the road to the topography by locating roads on natural benches and following natural contours. Avoid long, steep road grades and narrow canyons.

4. Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope. Avoid slumps and slide-prone areas characterized by steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture-laden or unstable toe slopes, seeps, wetlands, wet meadows, and natural drainage channels.

5. Minimize the number of stream crossings and choose stable stream crossing sites.

6. Locate roads to provide access to suitable (relatively flat and well-drained) log landing areas to reduce soil disturbance.*

B. Design

1. Properly design roads and drainage facilities to prevent potential water quality problems from road construction.*

2. Design roads to the minimum standard necessary to accommodate anticipated use and equipment. The need for higher engineering standards can be alleviated through proper road-use management.

3. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible.*

4. Design roads to minimize disruption of natural drainage patterns. Vary road grades to reduce concentrated flow in road drainage ditches, culverts, and on fill slopes and road surfaces.

C. **Road Drainage.** Road Drainage is defined as all applied mechanisms for managing water in a non-stream crossing setting, road surface drainage, and overland flow; ditch relief, cross drains and drain dips)

1. Provide adequate drainage from the surface of all permanent and temporary roads. Use outsloped, insloped or crowned roads, and install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.

    a. Outsloped roads provide a means of dispersing water in a low-energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety can be met.

    b. For in-sloped roads, plan ditch gradients steep enough, generally greater than 2% but less than 8%, to prevent sediment deposition and ditch erosion. The steeper gradients may be suitable for more stable soils; use the lower gradients for less stable soils.

    c. Design and install road surface drainage features at adequate spacing to control erosion; steeper gradients require more frequent drainage features. Properly constructed drain dips can be an economical method of road surface drainage. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them.

2. Design all ephemeral draw culverts with adequate length to allow for road fill width. Minimum culvert size is 15 inch. Install culverts to prevent erosion of fill, seepage and failure as described in V.C.4 and maintain cover for culverts as described in V.C.6.

3. Design all relief culverts with adequate length to allow for road fill width. Protect the inflow end of all relief culverts from plugging and armor if in erodible soil. When necessary construct catch basins with stable side slopes. Unless water flows from two directions, skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.

4. Where possible, install culverts at the gradient of the original ground slope; otherwise, armor outlets with rock or anchor downspouts to carry water safely across the fill slope.

5. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at outlet of drainage features. Crossdrains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection.

6. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.*

7. Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment doesn't reach surface water. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.

D. **<u>Construction</u>** (see also Section IV on stream crossings.)

1. Keep slope stabilization, erosion and sediment control work current with road construction. Install drainage features as part of the construction process, ensuring that drainage structures are fully functional. Complete or stabilize road sections within same operating season.*

2. Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means.

3. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment (example, slash filter windrow). When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can also provide an economical way of disposing of roadway slash. Limit the height, width and length of "slash filter windrows" so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.

4. Minimize earthmoving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.*

5. Construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion.

6. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill.

7. Consider road surfacing to minimize erosion.*

8. Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.

9. Minimize sediment production from borrow pits and gravel sources through proper location, development and reclamation.

10. When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces. Prior to reconstruction of existing roads within the SMZ, refer to the SMZ law. Consider abandoning existing roads when their use would aggravate erosion.

E. Maintenance

1. Grade road surfaces only as often as necessary to maintain a stable running surface and adequate surface drainage.

2. Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.

3. Avoid cutting the toe of cut slopes when grading roads, pulling ditches, or plowing snow.

4. When plowing snow, provide breaks in snow berm to allow road drainage.*

5. Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid sidecasting in locations where erosion will carry materials into a stream.*

6. Avoid using roads during wet periods if such use would likely damage the road drainage features. Consider gates, barricades or signs to limit use of roads during spring break up or other wet periods.

7. Upon completion of seasonal operations, ensure that drainage features are fully functional. The road surface should be crowned, outsloped, insloped, or water-barred. Remove berms from the outside edge where runoff is channeled.*

8. Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; reseed and/or scarify; and, if necessary, recontour and provide water bars or drain dips.

IV. TIMBER HARVESTING, AND SITE PREPARATION

A. Harvest Design

1. Plan timber harvest in consideration of your management objectives and the following*:

    a. Soils and erosion hazard identification.
    b. Rainfall.
    c. Topography.

d. Silvicultural objectives.
e. Critical components (aspect, water courses, landform, etc.).
f. Habitat types.
g. Potential effects on water quality and beneficial water uses.
h. Watershed condition and cumulative effects of multiple timber management activities on water yield and sediment production.
i. Wildlife habitat.

2. Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.

3. Use the economically feasible yarding system that will minimize road densities.*

4. Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction. Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.*

5. Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Limit the grade of constructed skid trails on geologically unstable, saturated, highly erosive, or easily compacted soils to a maximum of 30 percent. Use mitigating measures such as water bars and grass seeding to reduce erosion on skid trails.

6. Minimize the size and number of landings to accommodate safe, economical operation. Avoid locating landings that require skidding across drainage bottoms.

B. Other Harvesting Activities

1. Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40 percent unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.

2. Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen (see Section VI on winter logging).

3. Use directional felling or alternative skidding systems for harvest operations in isolated wetlands.*

4. For each landing, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.

5. Ensure adequate drainage on skid trails to prevent erosion. On gentle slopes with slight disturbance, a light ground cover of slash, mulch or seed may be sufficient. Appropriate spacing between water bars is dependent on the soil type and slope of the skid trails. Timely implementation is important.

6. When existing vegetation is inadequate to prevent accelerated erosion, apply seed or construct water bars before the next growing season on skid trails, landings and fire trails. A light ground cover of slash or mulch will retard erosion.*

C. Slash Treatment and Site Preparation

1. Rapid reforestation of harvested areas is encouraged to reestablish protective vegetation.*

2. When treating slash, care should be taken to preserve the surface soil horizon by using appropriate techniques and equipment. Avoid use of dozers with angle blades.

3. Minimize or eliminate elongated exposure of soils up and down the slope during mechanical scarification.*

4. Scarify the soil only to the extent necessary to meet the resource management objectives. Some slash and small brush should be left to slow surface runoff, return soil nutrients, and provide shade for seedlings.

5. Carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement.

6. Carry out scarification on steep slopes in a manner that minimizes erosion. Broadcast burning and/or herbicide application is preferred means for site preparation, especially on slopes greater than 40%.

7. Remove all logging machinery debris to proper disposal site.*

8. Limit water quality impacts of prescribed fire by constructing water bars in firelines; not placing slash in drainage features and avoiding intense fires unless needed to meet silvicultural goals. Avoid slash piles in the SMZ when using existing roads for landings.

V. STREAM CROSSINGS

A. Legal Requirements

1. Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures, fords, riprapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits.

   Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes on-site review, and the permitting process may take up to 60 days.

2. Stream-crossing projects initiated by federal, state or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks), rather than the 310 permit.

3. A short-term exemption (3a authorization) from water quality standards is necessary unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. Contact the Department of Environmental Quality in Helena at 444-2406 for additional information.

B. Design Considerations (Note: 310 permit required for perennial streams)

1. Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage to stream crossings. Direct drainage flows away from the stream crossing site or into an adequate filter.

2. Avoid unimproved stream crossings. Depending on location, culverts, bridges and stable/reinforced fords may be used. #

C. Installation of Stream Crossings (Note: 310 permit required for perennial streams.)

1. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.

2. Design stream-crossings for adequate passage of fish (if present) with minimum impact on water quality. When using culverts to cross small

streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid outfall barriers. # (Underlined portion not rated in 2004 audits.)

3. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage. On stream crossings, design for, at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill. #

4. Install stream-crossing culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible.

5. Consider dewatering stream crossing sites during culvert installation.*

6. Maintain a 1-foot minimum cover for stream-crossing culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger culverts, to prevent crushing by traffic.

7. Use culverts with a minimum diameter of 15 inches for permanent stream crossings.*

D. Existing Stream Crossing

1. Ensure stream crossing culverts have adequate length to allow for road fill width and are maintained to preserve their hydrologic capacity. To prevent erosion of fill, provide or maintain armoring at inlet and/or outlet with rock or other suitable material where feasible. Maintain fill over culvert as described in V.C. 6. #

VI. Winter Logging

A. General

1. Consider snow-road construction and winter harvesting in isolated wetlands and other areas with high water tables or soil erosion and compaction hazards.*

2. Conduct winter logging operations when the ground is frozen or snow cover is adequate (generally more than one foot) to prevent rutting or displacement of soil. Be prepared to suspend operations if conditions change rapidly, and when the erosion hazard becomes high.*

3. Consult with operators experienced in winter logging techniques.*

B. Road Construction and Harvesting Considerations

1. For road systems across areas of poor bearing capacity, consider hauling only during frozen periods. During cold weather, plow any snow cover off of the roadway to facilitate deep freezing of the road grade prior to hauling.*

2. Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and ditches are open and functional.*

3. Use compacted snow for road beds in unroaded, wet or sensitive sites. Construct snow roads for single-entry harvests or for temporary roads.*

4. In wet, unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations only when adequate snow depth exists. Avoid steeper areas where frozen skid trails may be subject to erosion the next spring.*

5. Return the following summer and build erosion barriers on any trails that are steep enough to erode.*

VII. HAZARDOUS SUBSTANCES

A. General

1. Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. Follow all label instructions.

2. Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the State Department of Environmental Quality.*

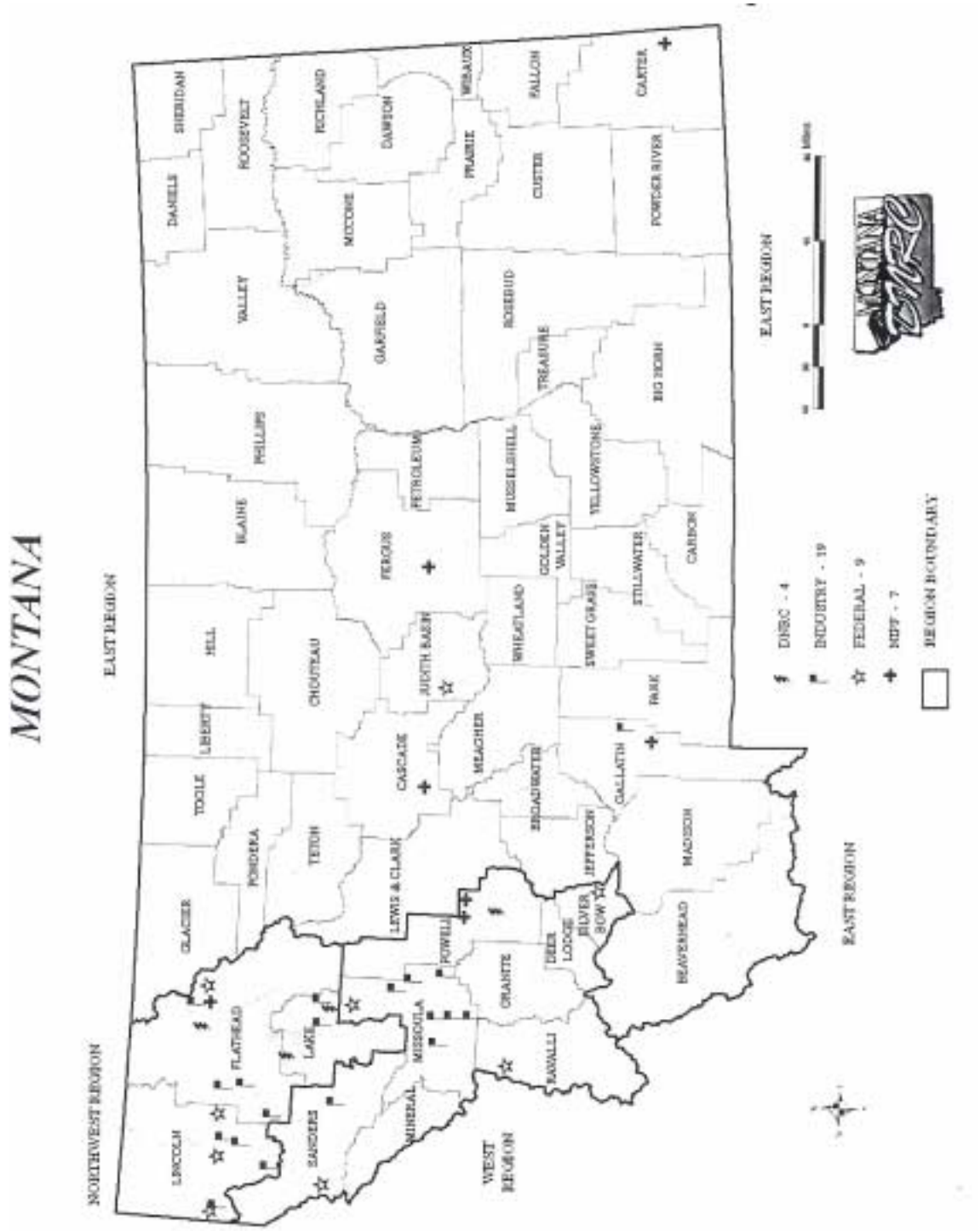
B. Pesticides and Herbicides

1. Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventive and chemical means.*

2. To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.*

APPENDIX B

2004 BMP AUDIT SITE LOCATION MAP



APPENDIX C

2004 BMP FIELD AUDITS

AUDITED SITES BY OWNERSHIP GROUP

SITE NUMBER	SITE NAME	COUNTY	OWNER	AUDIT TEAM
DNRC-1	LUKEWARM	POWELL	STATE	WEST
DNRC-2	ROLLINS CHUNK	LAKE	STATE	NORTHWEST
DNRC-3	BEAVER 2000	FLATHEAD	STATE	NORTHWEST
DNRC-4	SOUTH WOOD	LAKE	STATE	NORTHWEST
FED-1	NORTH MCSWEDE	LINCOLN	USFS	NORTHWEST
FED-2	EMMA HAINES	SANDERS	USFS	WEST
FED-3	BLODGET STEWARDSHIP	RAVALLI	USFS	WEST
FED-4	THOMPSON PARK HAZARD	SILVERBOW	USFS	WEST
FED-5	CLEARWATER STEWARDSHIP	MISSOULA	USFS	WEST
FED-6	DRY WOLF STEWARDSHIP UNIT 1	JUDITH BASIN	USFS	EAST
FED-7	LOWER EMERY	FLATHEAD	USFS	NORTHWEST
FED-8	HELP CREEK	LINCOLN	USFS	NORTHWEST
FED-9	KEELER HELI	LINCOLN	USFS	NORTHWEST
IND-1	BTN-26	GALLATIN	RY TIMBER	EAST
IND-2	WEEKSVILLE LINE	SANDERS	PCTC	WEST
IND-3	INDIAN LAKE	SANDERS	PCTC	WEST
IND-4	CAP WALLACE ROAD	MISSOULA	PCTC	WEST
IND-5	BRUSHFIT LINE 2	MISSOULA	PCTC	WEST
IND-6	LP LINE	MISSOULA	PCTC	WEST
IND-7	PARK IT MILLER	MISSOULA	PCTC	WEST
IND-8	MARSHALL 33 LINE	MISSOULA	PCTC	WEST
IND-9	COONEY STUBS (A,B,C)	RAVALLI	PCTC	WEST
IND-10	DEPUTY MECH	MISSOULA	PCTC	WEST
IND-11	RED TAPE	LINCOLN	STIMSON	NORTHWEST
IND-12	MARION POWER SMZ	FLATHEAD	PCTC	NORTHWEST
IND-13	LOGAN CREEK	FLATHEAD	PCTC	NORTHWEST
IND-14	VANGUARD	LAKE	PCTC	NORTHWEST
IND-15	ALL LINED OUT	LINCOLN	PCTC	NORTHWEST
IND-16	LION'S ROAR	LINCOLN	PCTC	NORTHWEST
IND-17	FRITZ MTN MECH	LINCOLN	PCTC	NORTHWEST
IND-18	LINE 24	LINCOLN	PCTC	NORTHWEST
IND-19	TRUMBULL 13/14 GF SAL	FLATHEAD	STOLTZE	NORTHWEST
NIPF-1	SIEBEN LIVESTOCK	CASCADE	PVT	EAST
NIPF-4	GRAVELEY	POWELL	PVT	WEST
NIPF-5	LEVERT	FLATHEAD	PVT	NORTHWEST
NIPF-6	POWELL	POWELL	PVT	WEST
NIPF-7	EAGLE ROCK	GALLATIN	PVT	EAST
NIPF-8	HOLERZ	CARTER	PVT	EAST
NIPF-9	DAHL	FERGUS	PVT	EAST

APPENDIX D

SAMPLE BMP AUDIT SITE INFORMATION FORM
NIPF

Please complete this sheet for each site that meets minimum criteria (see back for instructions). Please attach a sale area map for each site. Highlight or otherwise identify new road construction/reconstruction and Streamside Management Zones
All references to streams and Streamside Management Zones based on SMZ Law (see back)

Minimum Criteria

(1) Timber harvested during **Calendar Years** 2001, 2002, 2003 **and**
(2) Some portion of the sale (cutting unit) is located within 200 feet of a stream, **and**
(3) Minimum size of 5 acres and 5,000 BF/acre (westside), 3,000 BF/acre (eastside) harvested

Land Owner Name _____ Phone # _____
Agreement Number _____
Contractor Name _____ Phone # _____
Sale Name _____
Legal Description Section_____ TWN _____ RNG _____County_____
Primary Drainage _____
New Road Construction (Since 1997) Yes___ No___ Miles _____ Yr. Complete_____
Reconstruction Yes ___ No ___ Miles _____ Yr. Complete_____
Stream Crossing Culvert Installation (New) Yes ___ No ___
Stream Crossings On Road System Yes ___ No ___
Slash Disposal Complete Yes ___ No ___
Average MBF Volume/Acre Removed From Harvested Area _____MBF

Stream Within 200 Feet Of A Harvest Unit Yes ____No ____
Are SMZ's (SMZ Law Definition) Delineated Yes ____ No ____
Riparian Harvest Yes ___ No ___
Stream(s) Name _____
Stream Class (SMZ Law Definition) _____

Month/Year Harvest Conducted: From_____ To _____
Range Of Average Slopes For Individual Harvest Units: From_____ To _____

Geologic Parent Material (Circle any present)
Granitics Alluvium Lacustrine Shist Soft/Hard Sediments Basic Igneous

Skidding/Yarding Method (Circle all used)
Tracked Equipment Rubber Tired Equipment Partial Suspension Full Suspension

Harvest Methods Used (Circle any used) Partial Cut Clearcut

Service Forester or Local Contact Name _____ Number _____

APPENDIX E

2004 BMP FIELD AUDITS RISK RATING GUIDE
MONTANA "RISK" MATRIX (5/02)

TYPE		CLEAR-CUT				PARTIAL CUT				SITE PREP			ROADS	
SLOPE	SOIL EROD.	TERQAUCIKPED	RSUKBIBDER	PSAURSTPIAL	FSULLSP	TERAQCUIKPED	RSUBBIDER	PSARTSUSPIAL	FSUULSLP	MACHINE PILE/SCAR	BRDCAST BURN	OTHER	PERM	TEMP
0-5%	H	2	2	2	1	2**	2**	1	1	2	1	1	2**	3
	M	2	1	1	1**	2	1**	1	1	2**	1	1	1	1
	L	1	1	1	1	1	1	1	1	2	1	1	1	1
5-20%	H	4	3	2	1	4*	3	2	1	4	2	1	3	4
	M	3	2	1	1	3*	2	1	1	3	2	1	2	3
	L	2	2	1	1	2*	2*	1	1	2	1	1	2	2
20-40%	H	5	5	4*	2	5*	5*	3**	1	5	3**	1	4	5
	M	4*	4	3	1	3	3	2	1	4	3	1	3	4*
	L	3*	2	2	1	2	2	2	1	3	2	1	3*	3
>40%	H	5	5	4	2	5	5	4	2	5	4	1	5	5
	M	5	5	4	2*	5	5	3	1	5	4	1	5	5
	L	4	4	3	1	4	4	2	1	4	3*	1	4	4

(* Indicates Mean Value Used, ** Final Group Consensus Adjustment for Internal Consistency)

MONTANA EROSION-IMPACT MATRIX

From: "Management Guidelines for Riparian Forests" by Robert Pfister and Kim Sherwood. Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program.

LEGEND

1 = LOW RISK 2-3 = MODERATE RISK 4-5 = HIGH RISK

SOIL ERODIBILITY

HIGH ERODIBILITY	MODERATE ERODIBILITY	LOW ERODIBILITY
GRANITICS	SCHIST	ARGILLITE/QUARTZITE
ALLUVIUM	SOFT/HARD SEDIMENTS	METAMORPHIC (BELT)
LACUSTRINE	BASIC IGNEOUS	

HIGH RISK DUE TO RIPARIAN HARVEST

"HIGH" risk will be assigned to sales with logging in SMZ's or riparian zones along streams. Riparian zones are located between aquatic and terrestrial environments are identified by distinct vegetation that requires or tolerates free or unbound water. This includes but is not limited to the habitat types listed on the back of this matrix.

APPENDIX F

BMP AUDIT TEAM MEMBERSHIP
2004 AUDITS

	NORTHWEST	*WEST*	CENTRAL/EAST
FISHERIES	Scott Rumsey, DFWP+ (Tom Weaver, DFWP)+ (Mike Hensler, DFWP)+	Shane Hendrickson, USFS+ (Jim Bower, DNRC)	Don Skaar, DFWP+ Michael Enk, USFS+ Len Walch, USFS
HYDROLOGY	Steve Johnson, USFS (Brian Sudgen, PCTC)+	**Gary Frank, DNRC+*** (Renee Hanna, DNRC)+	Bo Stuart, USFS+ (Tony Nelson, DNRC)
SOILS	Lou Kuennen, USFS + (Dean Sirucek, USFS) (Bill Basko)+	Tim Wiersum NCRS+ (Dan Svoboda, USFS)+ (Wayne Barndt)+	Jeff Collins, DNRC Bob Logar, NRCS+ (Hal Hunter, PVT)+ (Sue Farley, USFS)
FORESTRY	Russ Hudson, PVT+ (Chuck Roady, Stoltze)#	Dick Wick, PCTC+ (Jim Mountjoy, Smurfit)+ (Chuck Seeley, Smurfit)	**Gordy Sanders, PML+*** Dwight Crawford , LP (Steve Flynn, LP)+ (Brian Robbins, DNRC)# (Gary Ullman, LP) (Don Kasten, BIA)
ENGINEERING AND ROADS	**Vic Andersen**, PCTC+* (Allen Wolf), DNRC+ (Jennifer Brady, USFS)+	Rhett Parker, PCTC + (Jennifer Brady, USFS) + (Ed Lamb, Smurfit)	D.J. Bakken, DNRC + (Bob Vlahovich, DNRC) **(Dennis Davaz , R-Y +*)** Mike Montgomery, PVT +
CONSERVATION		Bob Benson, CFC+ (Marnie Criley, Wild.CPR) +	Sue Duncan, MWA# Joel Webster, UM EVST#
NIPF/LOGGER	Mike Schlegel, MLA+ Pat Kearney, MLA +	Fred Hodgboom, MFOA + Debra Foley, MFOA#	Doug Mote, PVT+ Jerry Kelly, PVT
OBSERVER	Dan Bushnell, DNRC (Robert Lee, FWS) (R. Arne Wick, FWS)	Marcia Hughey, USFS Robert Lee, FWS R. Arne Wick, FWS	Dan Bushnell, DNRC

\+ Denotes Past Experience
* Denotes Team Leader
(*) Denotes Alternate Team Leader
() Denotes Alternate Team Member
# Denotes New Member

APPENDIX G
BMP AUDIT FORM

DS-49
Rev 1/04

BMP FIELD AUDITS
SITE INFORMATION

Site Number: _____

Meets Selection Criteria: Y/N _____
High Hazard: Y/N _____: Riparian _____Matrix____

Site Name: _____

Owner(s): _____

Legal Description: _____ County: _____

Primary Drainage: _____ Month/Year Harvested: _____

Stream Within 200 Ft.? Y / N Name: _____ Bankfull Width: _____

Unit Size: _____ Volume Removed: _____

Road Construction: _____ Length: _____

Road Reconstruction: _____ Length: _____

Slash Disposal Complete: _____ Method: _____

Logging Method: _____

Slope: 0-5%_____; 5-20%_____; 20-40%_____; 40%+_____

Parent Material: _____

Soil Erodibility: High____ Medium____ Low____

Harvest in SMZ: Y / N

Stream Class: _____

Comments:

Rating Guide

APPLICATION
5—Operation Exceeds Requirements Of Bmp
4—Operation Meets Requirements Of Bmp
3—Minor Departure From Bmp
2—Major Departure From Bmp
1—Gross Neglect Of Bmp

EFFECTIVENESS
5—Improved Protection Of Soil And Water Resources Over Pre-Project Condition
4—Adequate Protection Of Soil And Water Resources
3—Minor And Temporary Impacts On Soil & Water Resources
2—Major And Temporary Or Minor And Prolonged Impacts On Soil And Water Resources.
1—Major And Prolonged Impacts On Soil And Water Resources.

DEFINITIONS (BY EXAMPLE)
Adequate—Small amount of material eroded;
Material does not reach draws, channels, or floodplain.
Minor—Erosion and delivery of material to draws but not stream.
Major—Erosion and subsequent delivery of sediment to stream or annual floodplain.
Temporary—Impacts lasting one year or less; no more than one runoff season.
Prolonged—Impacts lasting more than one year.

NR – Not Reviewed NA – Not Applicable

FIELD AUDIT

Date: _____

Team Leader/Recorder: _____
Team Members:

Observers Present:

MONTANA FOREST PRACTICES REVIEW WORKSHEET

BMPs Applicable to:

\+ New Road Construction

\# Existing Roads

➢ Reconstruction

RECOMMENDED BEST MANAGEMENT PRACTICES	APPLICABLE TO SITE (Y/N)	APPLICATION	EFFECTIVENESS	COMMENTS
SECTION III—ROADS				
ROAD PLANNING & LOCATION SECTION III. A.				
➢+ 1a. Minimize number of roads necessary.				
# 1b. Use existing roads unless aggravated erosion.				
+ 3. Avoid long, sustained, steep road grades.				
+ 4. Locations avoid high-hazard sites (i.e., wet areas and unstable slopes).				
+ 5a. Minimize number of stream crossings. Number _____.				
+ 5b. Choose stable stream crossing sites.				
ROAD DESIGN SECTION III.B.				
➢+ 2. Design roads to minimum standard necessary to accommodate anticipated uses.				
+ 4. Vary road grade to reduce concentrated drainage.				
ROAD DRAINAGE SECTION III. C.				
+➢# 1. Provide adequate road surface drainage for all roads.				
+➢ 2. Design ephemeral draw culverts with adequate length and size and to prevent erosion of fill. Minimum size 15" maintain cover.				
+➢# 3. Design all relief culverts with adequate length and appropriate skew. Protect inflow end from erosion. Catch basins where appropriate.				
+➢# 4. Install culverts at original gradient, otherwise rock armour or anchor downspouts.				
+➢# 5. Provide energy dissipaters at drainage structure outlets where needed.				
+➢# 7. Route road drainage through adequate filtration zones before entering a stream.				

MONTANA FOREST PRACTICES REVIEW WORKSHEET
BMPs Applicable to:
+ New Road Construction
# Existing Roads
➢ Reconstruction

		CONSTRUCTION/RECONSTRUCTION SECTION III. D.				
+➢	2.	Stabilise erodible soils (i.e., seeding, benching, mulching).				
+➢	3.	Provide effective sediment control on erodible fill slopes (ex. Slash filter windrow).				
+➢	5.	Cut and fill slopes at stable angles. Slope ratio: _____.				
+➢	6.	Avoid incorporating woody debris in road fill.				
+➢	8.	Excess materials (waste) placed in locations that avoid entering stream.				
+➢	9.	Sediment from borrow pits and gravel pits minimized.				
➢	10.	Reconstruct only to the extent necessary to provide adequate drainage and safety.				
		ROAD MAINTENANCE SECTION III. E.				
+➢#	1.	Grade roads as necessary to maintain drainage.				
+➢#	2.	Maintain erosion control features (dips, ditches and culverts functional).				
#	3.	Avoid cutting the toe of cut slopes.				
+➢#	6.	Avoid use of roads during wet periods and spring breakup.				
+➢#	8.	Abandoned roads in condition to provided adequate drainage without further maintenance.				
SECTION IV – TIMBER HARVESTING						
		HARVEST DESIGN SECTION IV. A.				
	2.	Suitable logging system for topography, soil type and season of operation.				
	5.	Design and locate skid trails to avoid concentrating runoff.				
	6.	Suitable location, size, and number of landings.				

MONTANA FOREST PRACTICES REVIEW WORKSHEET
BMPs Applicable to:
+ New Road Construction
# Existing Roads
➢ Reconstruction

OTHER HARVESTING ACTIVITIES SECTION IV. B. 1a. Skidding operations minimizes soil compaction and displacement.				
1b. Avoid tractor skidding on unstable slopes and slopes that exceed 40% unless not causing excessive erosion.				
2. Avoid operation of equipment within isolated wetlands.				
4. Adequate drainage for landing.				
5. Adequate drainage for skid trails.				
SLASH TREATMENT AND SITE PREPARATION SECTION IV. C. 2. Treat slash so as to preserve the surface soil horizon.				
4. Scarify only to the extent necessary to meet resource management objective.				
5. Activities limited to frozen or dry conditions to minimize soil compaction and displacement.				
6. Equipment operations on suitable slopes only.				
8. Limit water quality impact of prescribed fire.				
SECTION V – STREAM CROSSINGS				
LEGAL REQUIREMENTS SECTION V. A. ➢+ 1. Proper permits for stream crossings.				
DESIGN CONSIDERATIONS SECTION V. B. ➢+ 1a. Cross streams at right angles, if practical.				
➢+ 1b. Direct road drainage away from stream crossing site.				
➢+ 2. Avoid unimproved stream crossings.				

MONTANA FOREST PRACTICES REVIEW WORKSHEET

BMPs Applicable to:

\+ New Road Construction

\# Existing Roads

➢ Reconstruction

	INSTALLATION OF STREAM CROSSINGS SECTION V. C.				
➢+	1. Minimize stream channel disturbance.				
➢+	2. Stream crossing culverts conform to natural streamed and slope.				
➢+	3. Proper sizing for stream crossing structures.				
➢+	4. Prevent erosion of stream crossing culverts and bridge fills (i.e., armor inlet and outlet).				
➢+	6. Minimum cover for stream crossing culverts provided.				
	EXISTING STREAM CROSSING SECTION V. D.				
#	1. Culverts are maintained to preserve their hydrologic capacity. Adequate length to allow for road fill width. Rock armoring. Maintain fill over culvert.				
	SECTION VII – HAZARDOUS SUBSTANCE				
	GENERAL				
	1. Know and comply with regulations governing the storage, handling, etc. of hazardous substances.				
#	Project included road improvements to existing road system that reduced overall sediment delivery to streams.	Y/N Comment(s):			
+➢#	Road system contains third party road systems.	Y/N Comment(s)			

ADDITIONAL COMMENTS:

MONTANA FOREST PRACTICES REVIEW WORKSHEET

BMPs Applicable to:

+ New Road Construction

Existing Roads

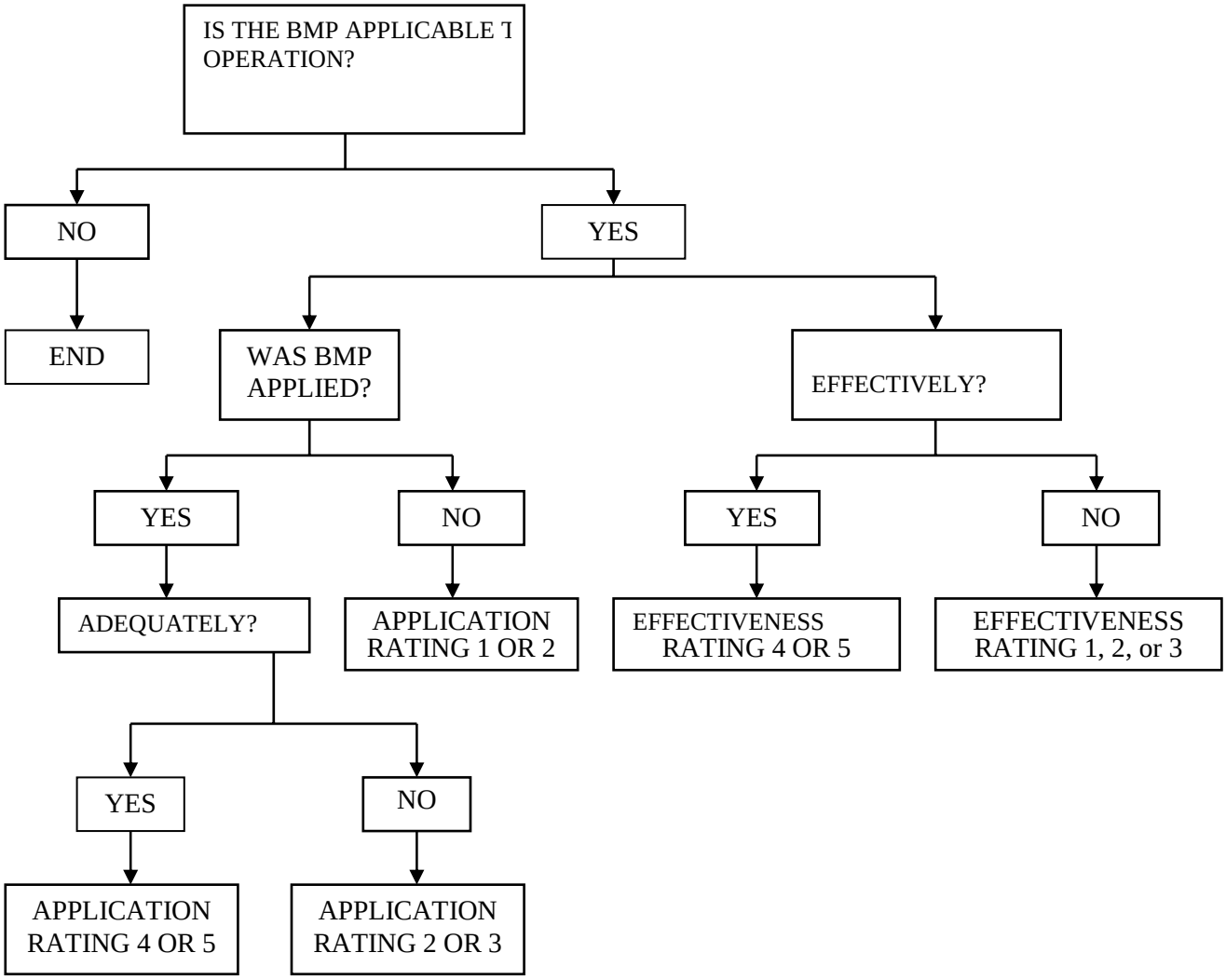
➢ Reconstruction

STREAMSIDE MANAGEMENT ZONE SITE INFORMATION				
***RECOMMENDED BEST MANAGEMENT* PRACTICES**				**COMMENTS**
1a. Adequate SMZ width maintained, avg. width _____.				
1b. SMZ properly marked?				
2. Exclusion of broadcast burning in SMZ.				
3. SMZ retention tree requirements met. (# of trees, representative of pre-harvest stand, favor bank-edge and leaning trees, shrubs and sub merchantable).				
4. Exclusion of equipment operation in SMZ except on established roads.				
5. Exclude construction of roads in the SMZ except when necessary to cross a Stream or wetland.				
6. Exclusion of road fill material deposited in SMZ except as needed to construct crossings.				
7. Exclusion of side-casting of road material into a stream, lake, wetland or other body of water during road maintenance.				
8. Exclusion of slash in streams, lakes or other bodies of water.				
9. Exclude the handling, storage, application of disposal of hazardous or toxic materials in the SMZ in a manner that pollutes or causes damage or injury.				
10. Pre-approved alternative practices				
11. DNRC approved site-specific alternative practices.				

ADDITIONAL COMMENTS:

APPENDIX H

BMP AUDIT RATING FLOW CHART



APPENDIX I

AUDIT RESULTS BY INDIVIDUAL BMP

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
III.A.1a	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	7	2	0	0	0	0	8	1	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	5	0	2	0	0	0	5	0	2
	Total:	0	0	0	34	2	3	0	0	0	35	1	3
III.A.1b	DNR	0	0	0	3	1	0	0	0	0	3	1	0
	FED	0	0	0	7	2	0	0	0	0	7	2	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	36	3	0	0	0	0	36	3	0
III.A.3	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	4	0	5	0	0	0	4	0	5
	IND	0	0	0	17	0	2	0	0	0	17	0	2
	NIP	0	0	0	2	0	5	0	0	0	2	0	5
	Total:	0	0	0	27	0	12	0	0	0	27	0	12
III.A.4	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	4	0	5	0	0	0	4	0	5
	IND	0	0	0	17	0	2	0	0	0	17	0	2
	NIP	0	0	0	2	0	5	0	0	0	2	0	5
	Total:	0	0	0	27	0	12	0	0	0	27	0	12
III.A.5a	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	4	0	5	0	0	0	4	0	5
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	2	0	5	0	0	0	2	0	5
	Total:	0	0	0	26	0	13	0	0	0	26	0	13
III.A.5b	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	4	0	5	0	0	0	4	0	5
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP						7						7
	Total:	0	0	0	24	0	15	0	0	0	24	0	15
III.B.2	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	8	0	1	0	0	0	8	0	1
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	0	33	0	6	0	0	0	33	0	6
III.B.4	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	4	0	5	0	0	0	4	0	5
	IND	0	0	0	17	0	2	0	0	0	17	0	2
	NIP	0	0	0	2	0	5	0	0	0	2	0	5
	Total:	0	0	0	27	0	12	0	0	0	27	0	12

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
III.C.1	DNR	0	0	2	2	0	0	0	0	1	3	0	0
	FED	0	2	1	6	0	0	0	2	0	7	0	0
	IND	0	0	1	18	0	0	0	0	0	19	0	0
	NIP	0	0	1	6	0	0	0	0	0	7	0	0
	Total:	0	2	5	32	0	0	0	2	1	36	0	0
III.C.2	DNR	0	0	0	2	0	2	0	0	0	2	0	2
	FED	0	0	0	4	0	5	0	0	0	4	0	5
	IND	0	0	0	14	0	5	0	0	0	14	0	5
	NIP						7						7
	Total:	0	0	0	20	0	19	0	0	0	20	0	19
III.C.3	DNR	0	0	0	2	0	2	0	0	0	2	0	2
	FED	0	0	1	8	0	0	0	0	0	9	0	0
	IND	0	0	1	13	0	5	0	0	0	14	0	5
	NIP						7						7
	Total:	0	0	2	23	0	14	0	0	0	25	0	14
III.C.4	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	1	1	7	0	0	0	1	0	8	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP						7						7
	Total:	0	1	1	29	0	8	0	1	0	30	0	8
III.C.5	DNR	0	0	1	3	0	0	0	0	1	3	0	0
	FED	0	1	0	8	0	0	0	1	0	8	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	0	1	0	6	0	0	0	1	0	6
	Total:	0	1	1	31	0	6	0	1	1	31	0	6
III.C.7	DNR	0	0	1	3	0	0	0	1	0	3	0	0
	FED	0	2	2	4	1	0	1	2	0	6	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	0	5	0	2	0	0	0	5	0	2
	Total:	0	2	3	31	1	2	1	3	0	33	0	2
III.D.10	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	6	0	3	0	0	0	6	0	3
	IND	0	0	0	9	0	10	0	0	0	9	0	10
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	0	22	0	17	0	0	0	22	0	17
III.D.2	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	8	0	1	0	0	0	8	0	1
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	1	3	0	3	0	0	0	4	0	3
	Total:	0	0	1	33	0	5	0	0	0	34	0	5

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
III.D.3	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	2	6	0	1	0	1	1	6	0	1
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	2	31	0	6	0	1	1	31	0	6
III.D.5	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	8	0	1	0	0	0	8	0	1
	IND	0	0	1	17	0	1	0	1	0	17	0	1
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	1	32	0	6	0	1	0	32	0	6
III.D.6	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	8	0	1	0	0	0	8	0	1
	IND	0	0	2	16	0	1	0	0	0	18	0	1
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	2	31	0	6	0	0	0	33	0	6
III.D.8	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	7	0	2	0	0	0	7	0	2
	IND	0	0	0	17	0	2	0	0	0	17	0	2
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	0	31	0	8	0	0	0	31	0	8
III.D.9	DNR	0	0	0	2	0	2	0	0	0	2	0	2
	FED						9						9
	IND	0	0	0	2	0	17	0	0	0	2	0	17
	NIP	0	0	0	1	0	6	0	0	0	1	0	6
	Total:	0	0	0	5	0	34	0	0	0	5	0	34
III.E.1	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	2	5	0	0	0	0	0	7	0	0
	Total:	0	0	2	37	0	0	0	0	0	39	0	0
III.E.2	DNR	0	0	1	3	0	0	0	0	0	4	0	0
	FED	0	0	4	5	0	0	0	0	3	6	0	0
	IND	0	0	3	16	0	0	0	0	0	19	0	0
	NIP	0	0	1	6	0	0	0	0	0	7	0	0
	Total:	0	0	9	30	0	0	0	0	3	36	0	0
III.E.3	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	39	0	0	0	0	0	39	0	0

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
III.E.6	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	1	0	8	0	0	0	0	1	8	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	1	6	0	0	0	0	0	7	0	0
	Total:	0	1	1	37	0	0	0	0	1	38	0	0
III.E.8	DNR	0	0	0	3	1	0	0	0	0	1	3	0
	FED	0	0	0	3	1	5	0	0	0	3	1	5
	IND	0	0	0	6	0	13	0	0	0	5	1	13
	NIP						7						7
	Total:	0	0	0	12	2	25	0	0	0	9	5	25
IV.A.2	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	38	0	1	0	0	0	38	0	1
IV.A.5	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	1	0	16	0	2	0	0	1	16	0	2
	NIP	0	0	1	6	0	0	0	0	0	7	0	0
	Total:	0	1	1	35	0	2	0	0	1	36	0	2
IV.A.6	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	38	0	1	0	0	0	38	0	1
IV.B.1a	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	38	0	1	0	0	0	38	0	1
IV.B.1b	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	1	8	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	1	36	0	2	0	0	0	37	0	2
IV.B.2	DNR	0	0	0	2	0	2	0	0	0	2	0	2
	FED	0	0	1	2	0	6	0	0	0	3	0	6
	IND	0	0	0	8	0	11	0	0	0	8	0	11
	NIP	0	0	0	2	0	5	0	0	0	2	0	5
	Total:	0	0	1	14	0	24	0	0	0	15	0	24

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
IV.B.4	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	38	0	1	0	0	0	38	0	1
IV.B.5	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	1	7	1	0	0	0	0	9	0	0
	IND	0	1	0	16	0	2	0	0	1	16	0	2
	NIP	0	0	1	6	0	0	0	0	0	7	0	0
	Total:	0	1	2	33	1	2	0	0	1	36	0	2
IV.C.2	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	37	0	2	0	0	0	37	0	2
IV.C.4	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	17	0	2	0	0	0	17	0	2
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	36	0	3	0	0	0	36	0	3
IV.C.5	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	37	0	2	0	0	0	37	0	2
IV.C.6	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	18	0	1	0	0	0	18	0	1
	NIP	0	0	0	7	0	0	0	0	0	7	0	0
	Total:	0	0	0	37	0	2	0	0	0	37	0	2
IV.C.8	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	17	0	2	0	0	0	17	0	2
	NIP	0	0	2	5	0	0	0	0	0	7	0	0
	Total:	0	0	2	34	0	3	0	0	0	36	0	3
V.B.1a	DNR	0	0	0	4	0	0	0	0	0	3	1	0
	FED	0	0	0	6	0	3	0	0	0	6	0	3
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	4	0	2	0	0	0	4	0	2
	Total:	0	0	0	30	0	8	0	0	0	29	1	8

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
V.B.1b	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	1	1	3	0	4	1	0	0	4	0	4
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	4	0	2	0	0	0	4	0	2
	Total:	0	1	1	27	0	9	1	0	0	28	0	9
V.B.2	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED	0	0	0	5	0	4	0	0	0	5	0	4
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	5	0	2	0	0	0	5	0	2
	Total:	0	0	0	30	0	9	0	0	0	30	0	9
V.C.1	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	6	0	3	0	0	0	6	0	3
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	0	28	0	11	0	0	0	28	0	11
V.C.2	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	6	0	3	0	0	0	6	0	3
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	2	0	5	0	0	0	2	0	5
	Total:	0	0	0	27	0	12	0	0	0	27	0	12
V.C.3	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	1	5	0	3	0	0	0	6	0	3
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	3	0	4	0	0	0	3	0	4
	Total:	0	0	1	27	0	11	0	0	0	28	0	11
V.C.4	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	6	0	3	0	0	0	6	0	3
	IND	0	0	1	15	0	3	0	0	0	16	0	3
	NIP	0	0	1	0	0	6	1	0		0	0	6
	Total:	0	0	2	24	0	13	1	0	0	25	0	13
V.C.6	DNR	0	0	0	3	0	1	0	0	0	3	0	1
	FED	0	0	0	6	0	3	0	0	0	6	0	3
	IND	0	0	0	16	0	3	0	0	0	16	0	3
	NIP	0	0	0	1	0	6	0	0	0	1	0	6
	Total:	0	0	0	26	0	13	0	0	0	26	0	13
V.D.1	DNR	0	0	0	1	0	3	0	0	0	1	0	3
	FED	0	0	1	7	0	1	0	0	1	7	0	1
	IND	0	0	0	10	0	9	0	0	0	10	0	9
	NIP	0	0	0	1	0	6	0	0	0	1	0	6
	Total:	0	0	1	19	0	19	0	0	1	19	0	19

2004 BMP RATINGS BY PRACTICE AND OWNERSHIP GROUP

		APPLICATION						EFFECTIVENESS					
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
Hazardous Substances	DNR	0	0	0	4	0	0	0	0	0	4	0	0
	FED						1						1
	FED	0	0	0	9	0	0	0	0	0	9	0	0
	IND	0	0	0	19	0	0	0	0	0	19	0	0
	NIP	0	0	0	6	0	0	0	0	0	6	0	0
	Total:	0	0	0	38	0	1	0	0	0	38	0	1

	APPLICATION						EFFECTIVENESS					
	1	**2**	**3**	**4**	**5**	**NR**	**1**	**2**	**3**	**4**	**5**	**NR**
Grand Total	0	10	42	1,467	9	383	3	9	10	1,496	10	383

APPENDIX J

SUMMARY OF 2004 AUDIT DEPARTURES AND IMPACTS BY BMP

BMP Sec	BMP Sub	BMP	APP 2	APP 3	**APP Tot**	EFF 1	EFF 2	EFF 3	**EFF Tot**	**Grand Tot**
* III	E	2	0	9	**9**	0	0	3	**3**	**12**
* III	C	1	2	5	**7**	0	2	1	**3**	**10**
* III	C	7	2	3	**5**	1	3	0	**4**	**9**
III	D	3	0	2	**2**	0	1	1	**2**	**4**
* IV	B	5	1	2	**3**	0	0	1	**1**	**4**
III	C	5	1	1	**2**	0	1	1	**2**	**4**
V	B	1b	1	1	**2**	1	0	0	**1**	**3**
III	C	4	1	1	**2**	0	1	0	**1**	**3**
* V	C	4	0	2	**2**	1	0	0	**1**	**3**
* IV	A	5	1	1	**2**	0	0	1	**1**	**3**
III	E	6	1	1	**2**	0	0	1	**1**	**3**
III	D	5	0	1	**1**	0	1	0	**1**	**2**
V	D	1	0	1	**1**	0	0	1	**1**	**2**
III	C	3	0	2	**2**	0	0	0	**0**	**2**
III	D	6	0	2	**2**	0	0	0	**0**	**2**
III	E	1	0	2	**2**	0	0	0	**0**	**2**
* IV	C	8	0	2	**2**	0	0	0	**0**	**2**
* III	D	2	0	1	**1**	0	0	0	**0**	**1**
IV	B	1b	0	1	**1**	0	0	0	**0**	**1**
IV	B	2	0	1	**1**	0	0	0	**0**	**1**
V	C	3	0	1	**1**	0	0	0	**0**	**1**
Totals			**10**	**42**	**52**	**3**	**9**	**10**	**22**	**74**

* - High Risk BMP's

APPENDIX K

COMPARISON OF 2002 AND 2004 RESULTS

Application of BMPs All Rated Practices by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated		Percentage (%) Practices Rated As							
			Meet or Exceed		Minor Departures		Major Departures		Gross Neglect	
	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002
DNRC	173	215	97%	98%	3%	2%	0%	<1%	0%	0%
Federal	354	178	93%	89%	5%	**7%**	2%	4%	0%	0%
Industrial	801	898	99%	98%	<1%	2%	<1%	<1%	0%	0%
NIPF	200	452	94%	94%	6%	6%	0%	2%	0%	0%
All Sites	1,528	1,743	97%	96%	3%	3%	<1%	1%	0%	0%

Audit Sites with Application Departures and Average Number of Departures per Site

Ownership Group	Total # of Sites		Percentage (%) of Sites w/out Departures		Percentage (%) of Sites With Departures						Average Number of Departures per Site*					
			Meet or Exceed		Minor		Major		Gross Neglect		Minor		Major		Gross Neglect	
	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002
DNRC	4	5	50%	60%	50%	60%	0%	0%	0%	0%	1.25	1.0	0.0	0	0	0
Federal	9	5	11%	0%	89%	80%	44%	80%	0%	0%	1.9	2.4	0.89	1.6	0	0
Industrial	19	21	63%	48%	37%	52%	5%	4%	0%	0%	0.5	0.7	0.1	0.05	0	0
NIPF	7	12	29%	8%	71%	75%	0%	42%	0%	0%	1.6	2.2	0.0	1.5	0	0
All Sites	39	43	44%	33%	56%	60%	13%	23%	0%	%0	1.1	1.4	0.26	0.39	0	0

Effectiveness of BMPs for All Rated Practices by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated		Percentage (%) Practices Rated As							
			Adequate Protection		Minor/Temp. Impacts		Major/Temp., Minor/ Prolonged		Major/ Prolonged	
	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002
DNRC	173	215	98%	99%	<1%	1%	<1%	0%	0%	0%
Federal	354	178	96%	89%	2%	4%	2%	7%	<1%	0%
Industrial	801	898	99%	99%	<1%	<1%	<1%	<1%	0%	0%
NIPF	200	452	99%	95%	0%	2%	0%	3%	<1%	<1%
All Sites	1,528	1,743	99%	97%	<1%	1%	<1%	2%	<1%	<1%

Audit Sites with Impacts and Average Number of Impacts per Site

Ownership Group	Total # of Sites		Percentage (%) of Sites w/out Impacts		Percentage (%) of Sites With Impacts						Average Number of Impacts per Site*					
			Adequate or Improved Protection		Minor/ Temp.		Major/Temp. Minor/ Prolonged		Major/ Prolonged		Minor/ Temp.		Major/Temp. Minor/ Prolonged		Major/ Prolonged	
	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002
DNRC	4	5	75%	40%	25%	40%	25%	0%	0%	0%	0.5	0.6	0.25	0	0.0	0
Federal	9	5	33%	0%	33%	60%	33%	100%	11%	0%	0.6	1.4	0.77	2.6	0.22	0
Industrial	19	21	89%	57%	5%	29%	5%	6%	0%	0%	0.1	0.33	0.05	0.24	0.0	0
NIPF	7	12	86%	33%	0%	33%	0%	40%	14%	17%	0.0	0.67	0.0	1.0	0.14	1.7
All Sites	39	43	74%	42%	13%	37%	15%	35%	5%	4%	0.26	0.58	0.23	0.70	0.08	0.05

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